Operating Instructions

Double Thread Sewing Machine

Please preserve for future use !

HARDO-Maschinenbau GmbH
Postfach 320
D-32065 Bad Salzuflen Tel: 0 52 22 / 9301-5
Grüner Sand 78
D-32107 Bad Salzuflen Fax: 0 52 22 / 93016
e-mail: info@hardo-gmbh.de
Internet: www.hardo-gmbh.de

HARDO-Maschinenbau GmbH • Postfach 320 • D-32065 Bad Salzuflen

EC CONFORMITY DECLARATION
in the Sense of the EC Guidelines for Machines 89/392/EEC, Addendum II A

We hereby declare that the below-mentioned machine, thanks to its design, construction type and execution, meets with the relevant basic safety and health requirements of the EC Guidelines for Machines.

This declaration will become void, if the machine is modified without our prior consent.

CE

Designation of the Machine: **HARDO**- SEWING MACHINE DN ST 90

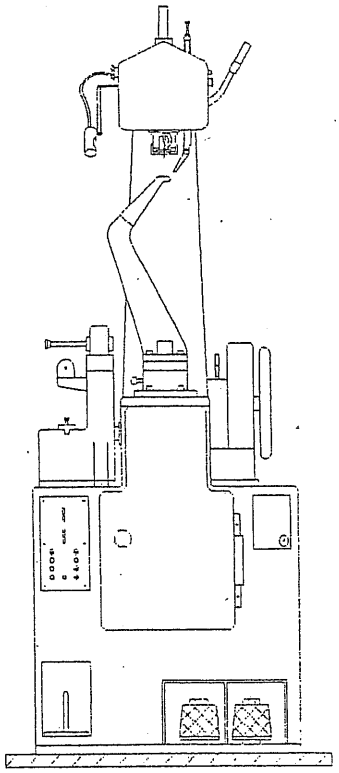
Machine No.:

Applied conforming standards: EN 292-2
EN 418
EN 60204

Bad Salzuflen, 01.06.1996

(Wehmeyer, Works Manager)

INSTRUCTION MANUAL FOR DOUBLE THREAD SEWING MACHINE



HARDO-Maschinenbau GmbH

Grüner Sand 78, 32107 Bad Salzuflen (Germany)
Tel. 0 52 22/ 9301-5
Fax. 0 52 22/ 93015

MODEL : ST 90

SERIAL N° :.....

YEAR OF CONSTRUCTION :.....

WARNING

1) In the technical descriptions, the location of all accessories and various machine parts is always given in relation to the control and work position.

2) In the technical descriptions, all mechanical details described are expressed with their technical term, and can be identified by **their part number expressed in brackets alongside.**

3) All operations described in this manual must be carried out with the motor switched off and only after having disconnected the machine from the electricity supply.

4) Make certain that the blocking lever on the right hand side of the sewing head which acts as a protection for the presser foot lift bar. Using the motor without setting this device (see drawing) will provoke the breaking of the lift bar in the case of rotation in the opposite direction.

5) Always use needles that correspond with the the thread used: 5 strand thread = needle N° 5

6) Use top quality linenthread with right twist, or polyester thread.

7) For the spool, use thread that is one or two strands thicker than that used on the horn:
Horn thread : 5 strand = spool thread : 6-7 strand.

8) Dampen the sole before stitching to make it softer to work.

INDEX LIST

1. MACHINE DESCRIPTION
1.1 Protection and safety precaution advice

2 TECHNICAL DESCRIPTION OF THE ST 90

3 CORRECT AND INCORRECT USE
3.1 Danger and warnings against incorrect use of the machine

4 TRANSPORT AND HANDLING OF THE MACHINE

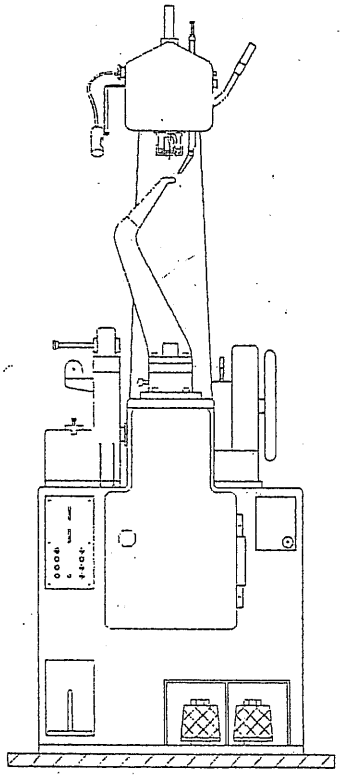
5 MACHINE INSTALLATION
5.1 Machine measurements
5.2 ST 90 base support
5.3 Front view of the machine with main reference points concerning ST 90
5.4 Distances to be observed around the machine

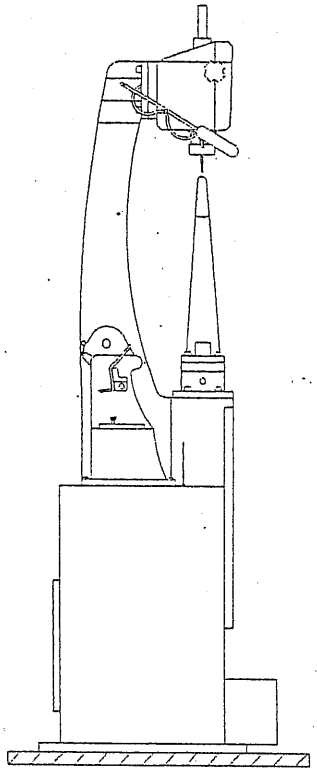
6 SETTING UP AND PREPARATION OF THE MACHINE READY FOR USE
6.1 Accessory assembly
6.2 Preliminary control checks
6.2.1. Check on any damage the machine may have suffered during transport
6.2.2. Machine cleaning procedure
6.3 Connection to external energy supply
6.3.1. Connection to electricity supply
6.4 Control, regulating and setting operations
6.4.1. Check on correct block lever position
6.4.2. Correct motor rotation direction check
6.4.2.1. Rules for correct function
6.4.2.2. Work speed
6.4.2.3. Motor belt tension
6.4.3. Stitch length adjustment
6.4.3.1. Horn thread tension adjustment
6.4.4. Presser foot pressure adjustment
6.4.5. Presser foot advance adjustment
6.4.6. Thread braking system adjustment
6.4.7. Thread tension adjustment

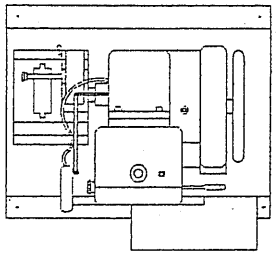
7. SETTING UP MACHINE READY FOR WORK
7.1. Electrical control panel
7.1.1. Preparation of emulsion container
7.2. Preparation of sewing thread
7.2.1. Preparation of Blake horn threading
7.2.2. Shuttle thread preparation
7.3. Positioning of material for stitching
7.4. Microswitch positions

1. MACHINE DESCRIPTION

The ST 90 machine manufactured by HARDO-Maschinenbau GmbH is a dual threaded machine with interchangeable horns for Blake and Opanka stitching.
The sewing operation is carried out by a needle and shuttle, mechanically run by a system with a transmission shaft, cam and gears, controlled by an a single or triple phase asynchronous electric motor and V-belt with A section .
The machine is equipped with a working and control panel, as shown in the technical drawing. This machine is designed for manual work







1.1 *Advice for protection and safety precautions.*

The manufacturer has provided for the following safety precautions:

1. Closeable front door to protect mechanical parts (thread pulling device) located in the machine base. This door can be opened using the appropriate handle.

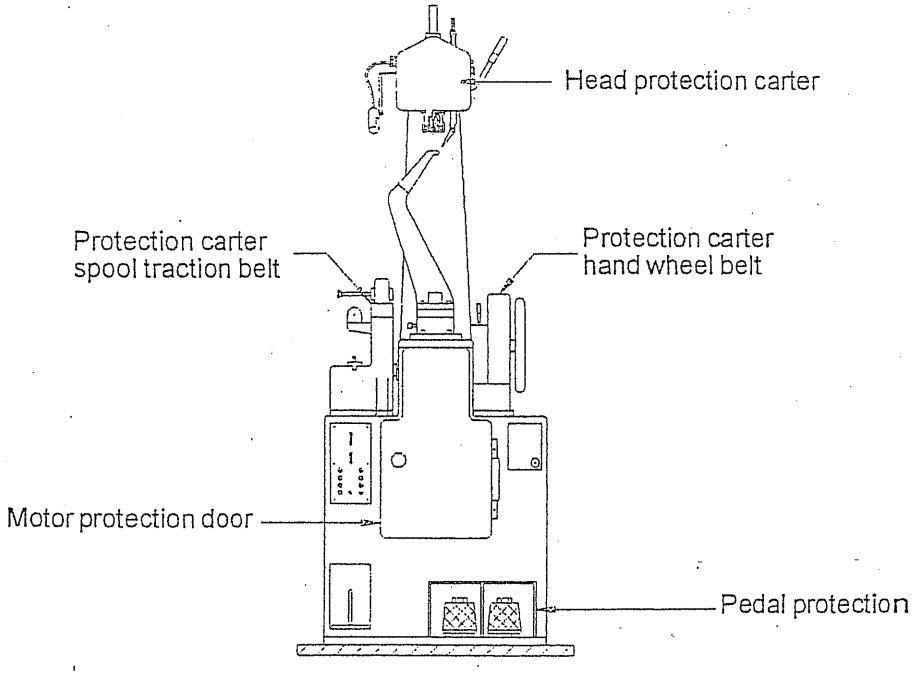
2. Protection carter for the control transmission belt.

3. Special plate to protect the motor and presser foot pedals.

4. Protection carter for the round leather belt for the spool winder.

5. Protection carter for the mechanical parts of the head, fixed with hexagonal screws.

Warning:
These protection systems have been provided by the manufacturer to protect the operator during work operations. The protection systems must not be removed for any reason during machine use.
It is extremely important that the operator take great care when using the machine during all sewing operations. Since it is impossible to install protection in the sewing area used by the operator, the operator must use eye protection. It is strongly advised that the operator take great care in using the machine correctly, paying close attention to the work underway, and to stop and rest if tired.
The operator must also take great care when working near the spool heater, and on machines equipped with wax container, near the wax container heater, as temperatures can be very hot.
Take great care not to use the pedal that controls the sewing speed by mistake, when the main motor is switched on.



8. MACHINE USE
8.1. Work cycle description
8.2. ST 90 sewing machine electrical layout
8.3. ST 90 sewing machine compressed air circuit

9 REPLACEMENT OPERATIONS
9.1. Replacement of shuttle heater resistance
9.2. Replacement of needle threader
9.3 Replacement of loop opener
9.4 Replacement and timing of whirl

10 ACCESSORIES
10.1 Shuttle spool preparation using the spool winder
10.2 Wax container
10.3 Spool winding

11 USE OF ST 90 SEWING MACHINE WITH OPANKA STITCHING HORN
11.1 Replacement of Blake stitching horn with Opanka horn

12 REPAIRS AND MAINTENANCE
12.1 Maintenance
12.2 Operations which must be carried out by qualified personnel
12.3 Possible problems that can arise with the ST 90
12.4. Spare parts and parts subject to wear and tear
12.5. Equipment supplied with the ST 90

13 DEMOLITION INSTRUCTIONS FOR THE ST 90

14 ST 90 SEWING MACHINE NOISE LEVEL

15 PRINCIPAL WARNINGS

FEATURES	*TECHNICAL INFORMATION*
Width	620 mm
Depth	570 mm
Height	1650 mm
Weight	180 Kg
Stitches per minute	from 120 to 150
Machine control system	motor with gear control
Horn height	460 mm actual height
Stitch length	variable from 3 to 14 mm
Maximum sewing thickness	Blake 27 mm. Opanka 15 mm
Maximum power	0.75 HP = 0.55 kW

TECHNICAL DESCRIPTION OF MAIN MOTOR (STITCHING CONTROL)

Triple phase tropicalised asynchronous electric motor

Power	0.75 HP = 0.55 kW
Rotation speed	1400 rpm at 50 Hz
Protection rating	IP 21

Attatched to the rear of the base is a metal plate containing all the main electrical features concerning the machine.

RUNNING POWER	.....
POWER SUPPLY	.....
SUPPLY FREQUENCY	.....

3 CORRECT AND INCORRECT USE

The ST 90 machine manufactured by HARDO-Maschinenbau GmbH is a double thread sewing machine with interchangeable horns for Blake and Opanka stitching.
Any operations other than those for which the machine was designed are considered as incorrect use, and can damage the machine, as well as creating a serious danger hazard for the operator.

3.1 Danger warnings and advice against incorrect use.

- The cam and control kinematics are set at the manufacturing plant.
- The work cycle is tested several times on each machine before delivery to the customer.

Under no condition must the cam and kinematic positions be changed in order to modify the machine's running sequence.

- The sewing machine's control driving pulley is calculated for the best possible working conditions and the maximum speed that permits the operator to work in complete safety.

It is absolutely forbidden for the user to replace the original driving pulley with another larger driving pulley.

Any change made to increase the sewing speed over the maximum established by the manufacturer constitutes a modification to the original design, and a source of danger for the operator working on the machine.

The sewing machine must never be used in explosion risk environments, so it is forbidden to use the machine in any environment where there is any risk of explosion.

-The machine was designed and built for sewing soles and other articles in leather, rubber, and synthetic materials.

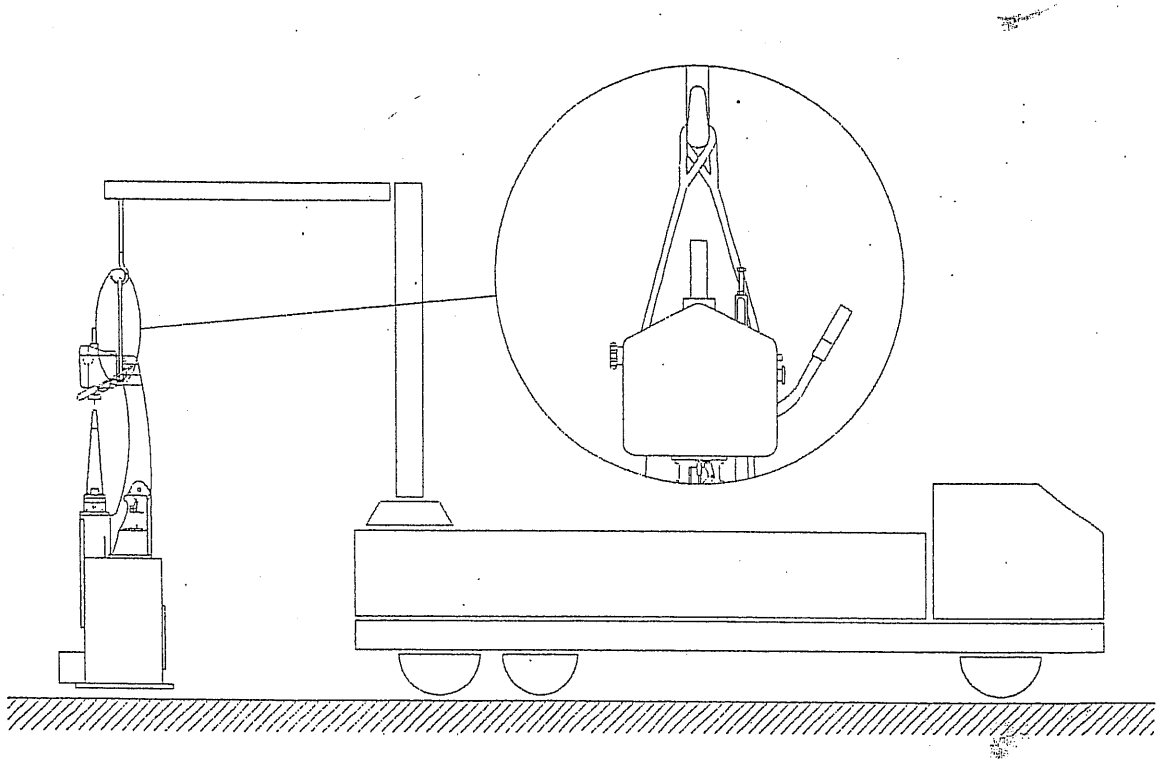
-For carrying out any operations not established for use with this machine, or in any case, for any interventions which need to be made to the machine, the user is requested to ask advice from the manufacturer concerning any danger or risk resulting from incorrect use of the machine.

4 TRANSPORT AND HANDLING OF THE MACHINE

Handling and transport of the _ST 90 sewing machine should be carried out as follows:

Using a belt of adequate size and thickness, strap around the head of the machine (as shown in the drawing) and attatch the two ends securely to the hoisting hook.

Raising and handling of the machine must be carried out using a small crane, with an expert driver .One of the handling crew must be on the ground to control the machine during movement, since the size and shape of the machine makes it difficult for the carne operator to see any eventual obstacles during machine handling.



Warning:

1) Whether the machine is placed on a pallet or shipped in an open or closed crate, all handling must be carried out appropriately according to the type of packing.

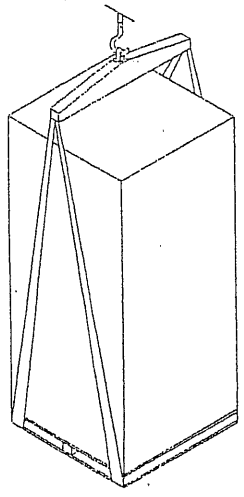
2) The machine must be fixed securely to the supporting pallet. To permit this, the machine base has been equipped with four 10 mm holes bored for bolting.
Bolting must be done with four M8 screws which pass through the plate for fixing the machine to the wooden pallet as shown in the following diagram.

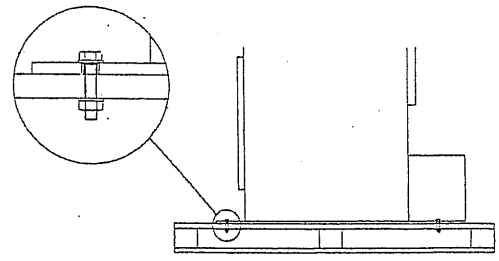
3) Make sure that nobody is present in the hoisting area to avoid injuries to personnel during the handling of the lifted load.

4) Especially when being shipped by sea, whether in an open or closed wooden crate, it is adviseable to pack the crate with bags of hygroscopic salt. It is also adviseable to protect the various machine parts by spraying with anti-rust paint.

5) The manufacturer packs the ST 90 *in a wooden crate which weighs a maximum of 60 Kg. Where the machine is shipped in a heavier case or crate, make certain that the hoisting and transport cables are adequate for the weight of the machine and the crate to avoid accident or injury.*

Machine transport in open or closed wooden crate



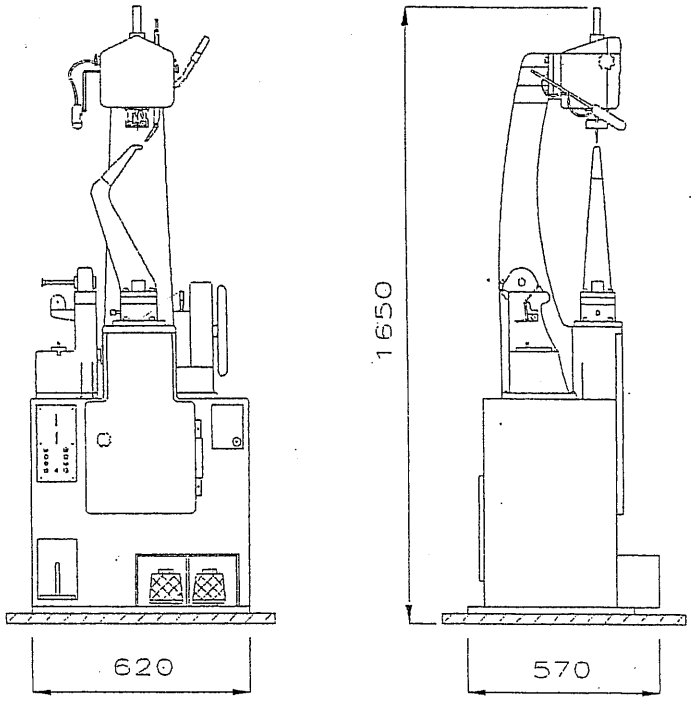


5 MACHINE INSTALLATION

Attention: The machine must be installed in an area with the best possible conditions as far as heat and humidity are concerned for the operator's safety and comfort in order to reduce strain to a minimum, and to provide maximum safety conditions.

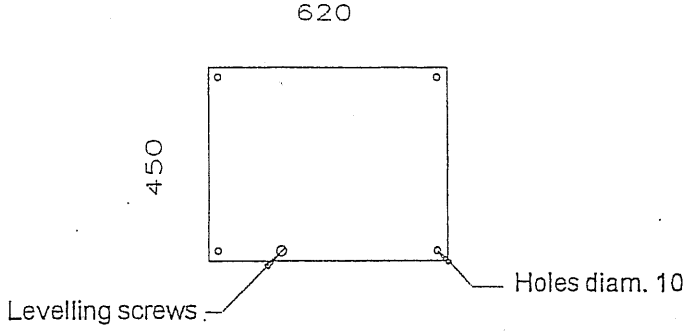
5.1. Machine measurements

The ST 90 measurements are shown in the drawing below:



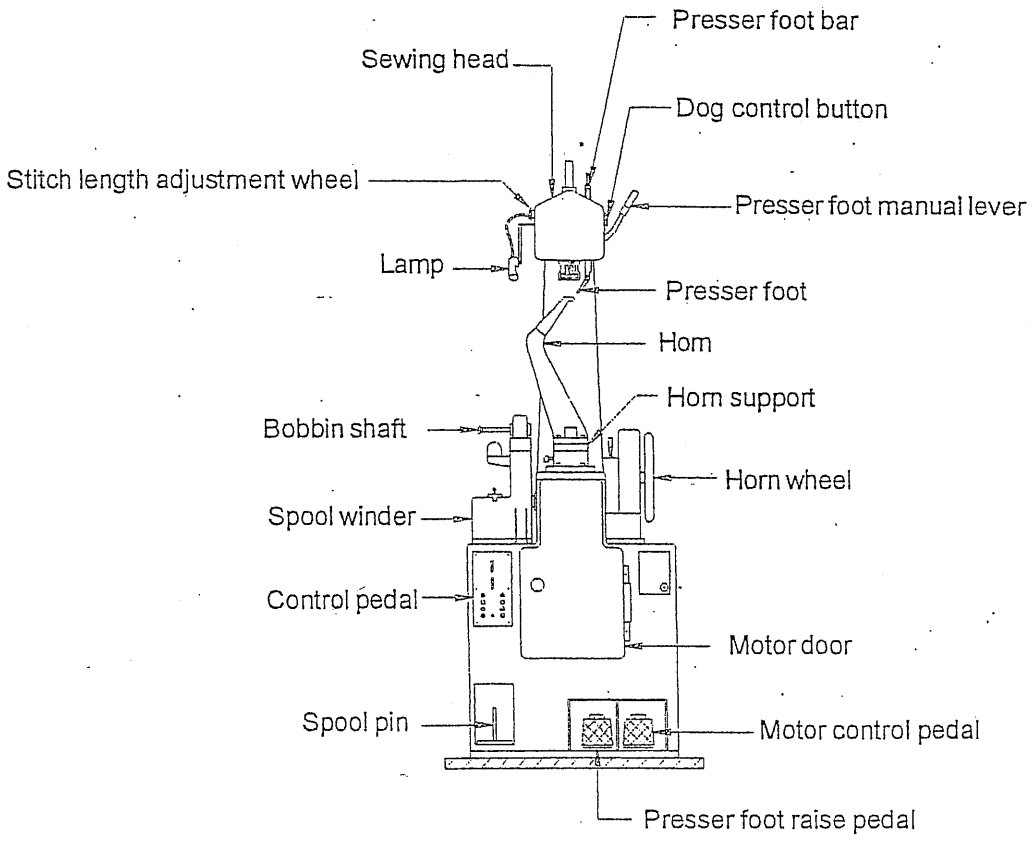
5.2 ST 90 Machine base support

To run correctly, the machine does not need to be fixed to the floor, nor does it need any technical adjustment to limit vibration transmission.



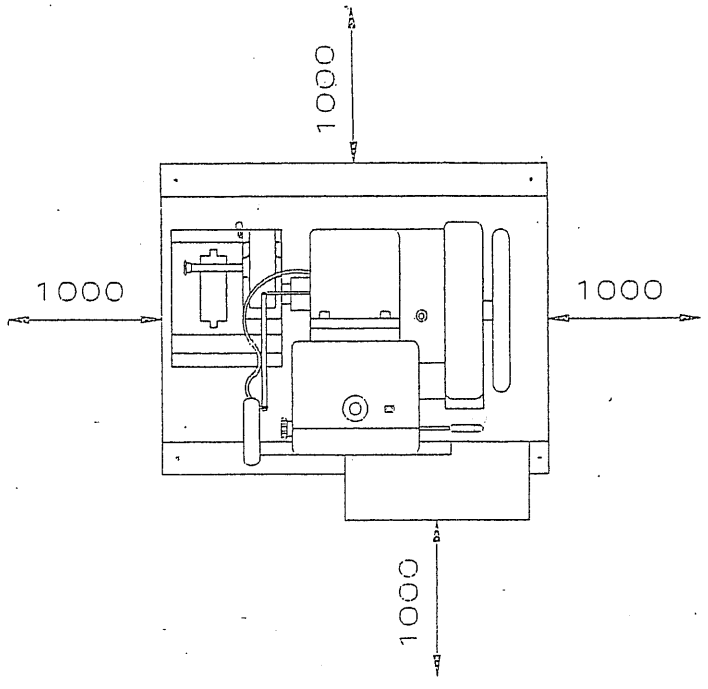
Warning:
For correct running conditions, adjust the levelling screws till perfect adhesion to the floor has been obtained. For perfect stability, it is also adviseable to place four rubber squares between 4 and 5 mm thick under each corner of the machine base.

5.3 Front view of the ST 90 with main reference points.



5.4 Distances to be observed around the machine.

For correct use of the machine, and to permit safe and easy repairs and maintenance, it is adviseable to respect the minimum distances around the machine as shown in the drawing.



6 SETTING UP AND PREAPARATION OF THE MACHINE READY FOR USE.

6.1 Accessory assembly

The machine is completely assembled at the manufacturing plant. On reception of the machine, the user does not need to assemble any particular additional machine parts.

6.2 Preliminary control checks

On reception of the machine it is adviseable to:
- check that all machine components have arrived at the destination (user's plant)
- run a series of preliminary control checks as follows:

6.2.1. Check on any damage the machine may have suffered

In order to establish any damage suffered by the machine during transport, control the condition of the following parts:
- end of run, and microswitches
- protection systems mounted on the machine
- electrical wiring, electrical components,
- horn.

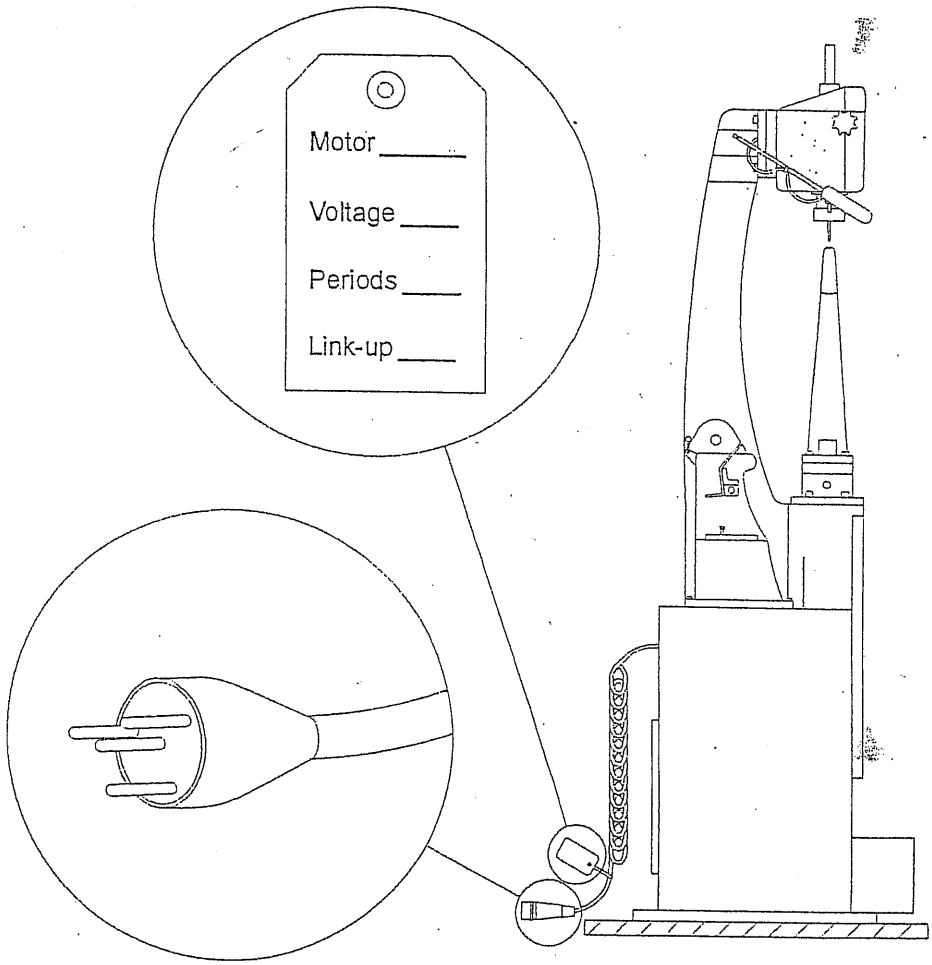
6.2.2. Machine cleaning

Clean the machine carefully, removing all dust and dirt or foreign matter that may have deposited during transport.
To carry out this work the operator should be provided with protective gloves and overall.
Eliminate all traces of anti-rust protection that has been sprayed to protect the machine from humidity.

6.3 *Connection to external energy supplies.*

6.3.1. *Connection to electricity supply.*

The machine is supplied with the electricity supply cable complete with appropriate plug. This means that the cable only has to be connected to the mains supply after having checked that the voltage and frequency of the motors and the electrical components on the machine are the same as those on the main supply at the user's factory.
The voltage and frequency of the machine are indicated on a cardboard label attatched to the supply cable.

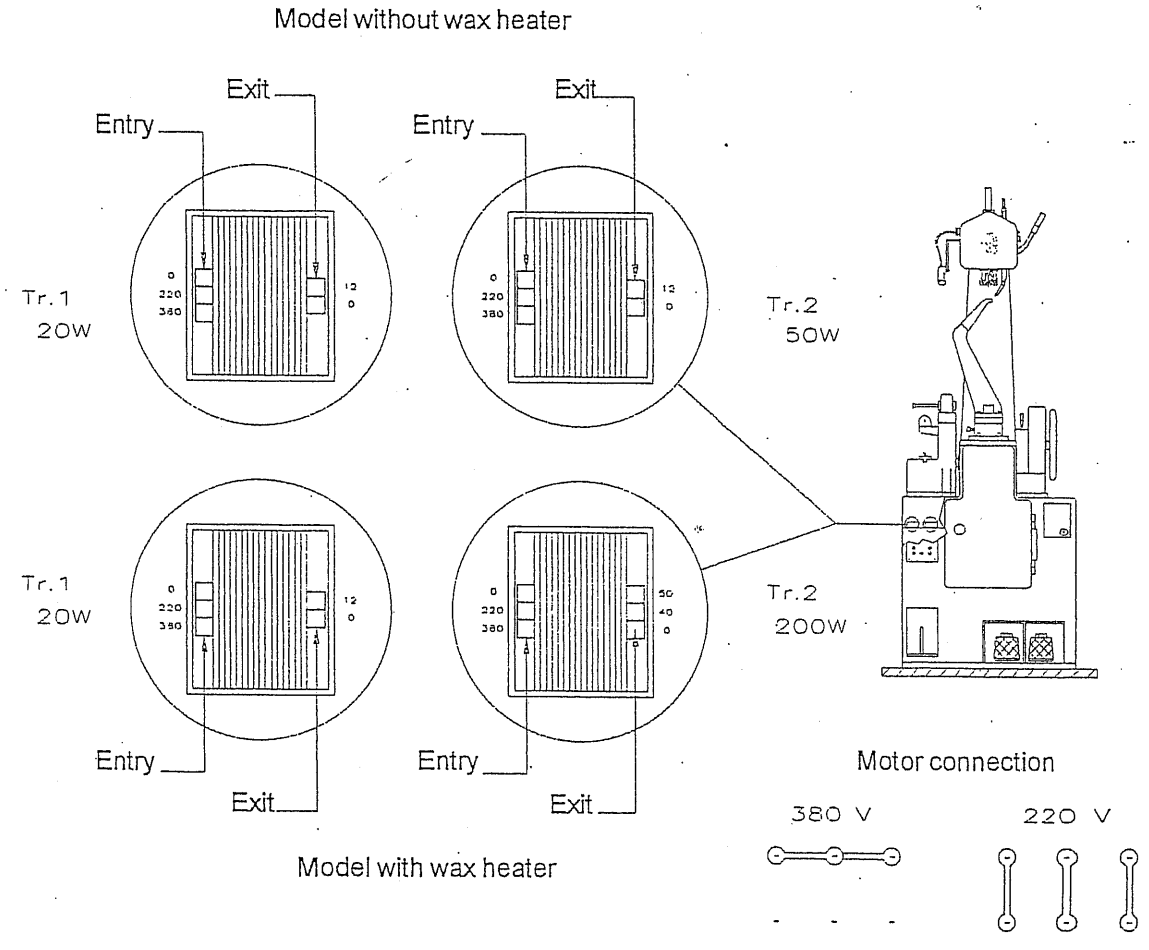


Warning:

1) It is adviseable to protect the user's main supply line against any overloading by using safety switches (magnetothermic switches)

2) Should the electricity supply not be the same as that indicated on the machine, the terminal board connections must be changed on the transformer, and main motor.
The electrical equipment transformer is located in a special housing as shown in the drawing ; for access, unscrew the 6 screws which fix the electrical control panel .

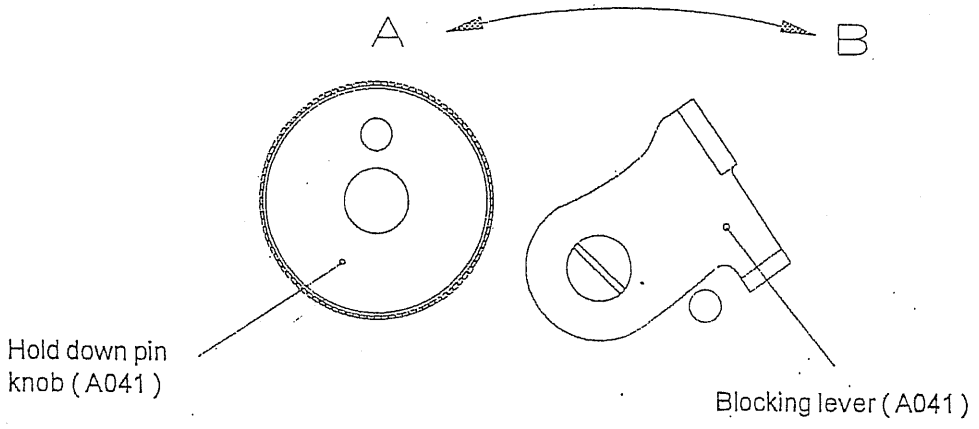
IMPORTANT: *Before carrying out this operation remember to switch off the electricity supply and to remove the cable plug from the main supply line.*



6.4. *Checks, adjusting, and setting to be carried out.*

6.4.1. *Check on correct blocking lever position.*

Set the mechanical protection system for the presser foot lift bar placed on the right hand side of the sewing head. If the motor is run without having set this protection system, in the case of rotation in the opposite direction, the lift bar will break.

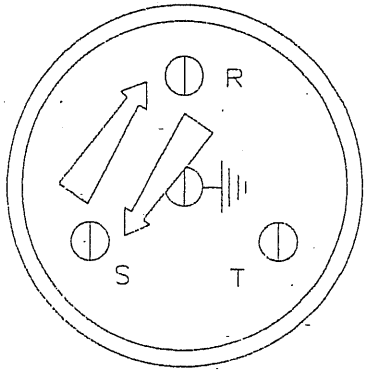


6.4.2. *Correct motor rotation direction check.*

To run this control check, proceed as follows:

- Turn the MAIN SWITCH to position N° 1. This will connect the electrical equipment on the machine to the supply, and provide movement possibility for the spool winder
- Check that motor is running in the correct direction. More exactly: if the luminous switch MAIN MOTOR RUNNING is turned on, check that the main motor rotation direction is the same as that indicated by the arrow on the handwheel belt protection carter. The pulley of the main motor should run in a clockwise direction.

When the sewing machine does not function as described above, the 2 phase wires in the main supply plug must be inverted.



6.4.2.1. General rules to be followed for correct machine function

1) Use needles which correspond to the thread used: 5 strand thread = needle N° 5.

2) Use top quality linen right twisted thread, or polyester thread.

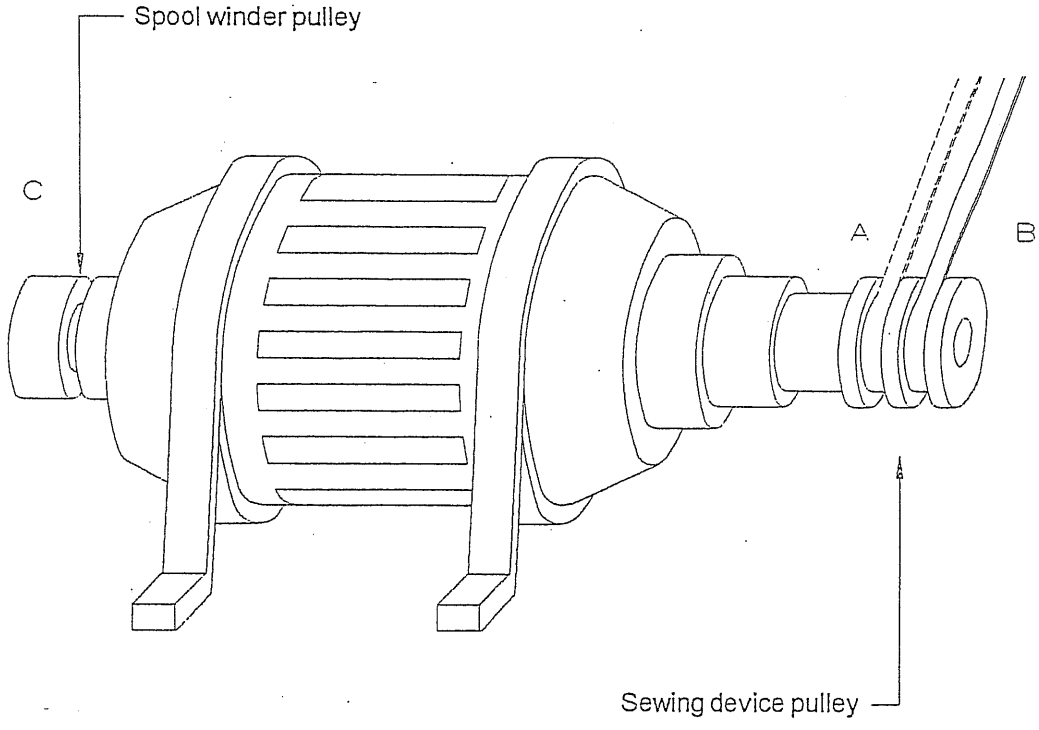
3) For the spool the thread must have one or twostrands more than that used for the horn.
e.g. horn: 5 strand thread . Spool: 6-7 strand thread.

4) Dampen the sole to soften the leather before stitching.

6.4.2.2. Work speed.

The machine works at two speeds. To increase or reduce speed, shift the T belt in the rim next to the V motor pulley (see drawing).

Speed with A pulley = 100 rpm
Speed with B pulley = 130 rpm



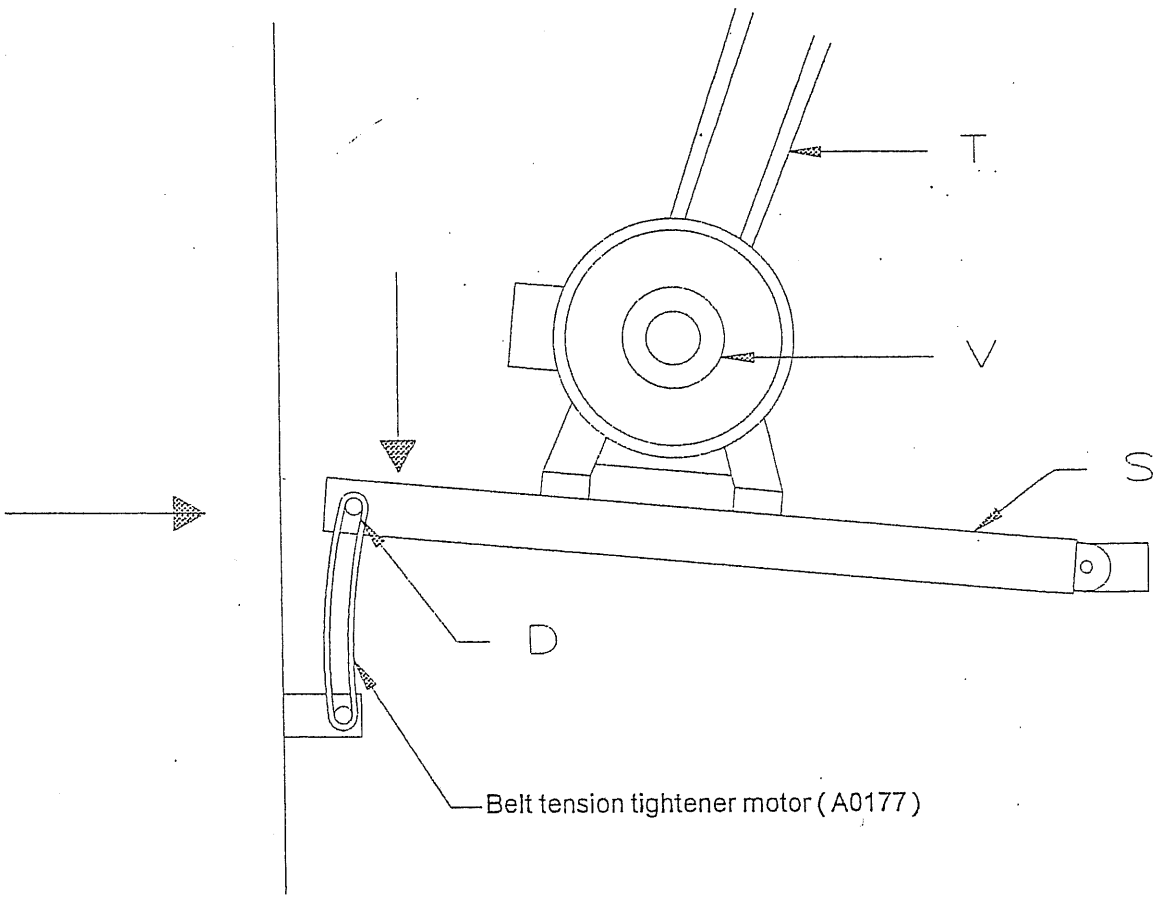
6.4.2.3. Belt tension adjustment.

Adjustment of the belt tension of the motor:

At least once every six months, the motor belt tension must be controlled and adjusted.

To adjust the tension , proceed as follows:

- Disconnect the machine from the electricity supply, by removing the cable plug.
- Remove the cover on the rear of the machine base
- Loosen the D screw between the belt tightening sector (A0177) and the motor support S.
- Press down on the motor support and the tightened belt.
- Tighten the screw.
- Replace the rear cover.

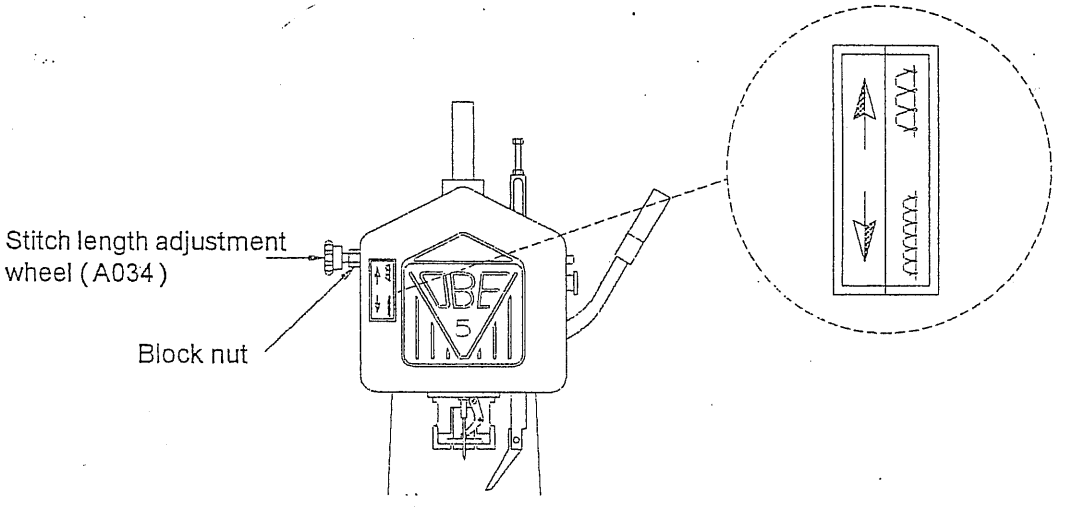


6.4.3. Stitch length adjustment.

To set the stitch length, proceed as follows:

- Turn the MAIN SWITCH TO 0 POSITION and disconnect the machine cable from the electricity supply.
- Loosen the blocking nut.
- urn the knob (A034) in order to adjust the stitch length. Stitching will increase in length when the knob is turned in an anti-clockwise direction, and decrease in a clockwise direction.
- When the stitch length is set, tighten the blocking nut.

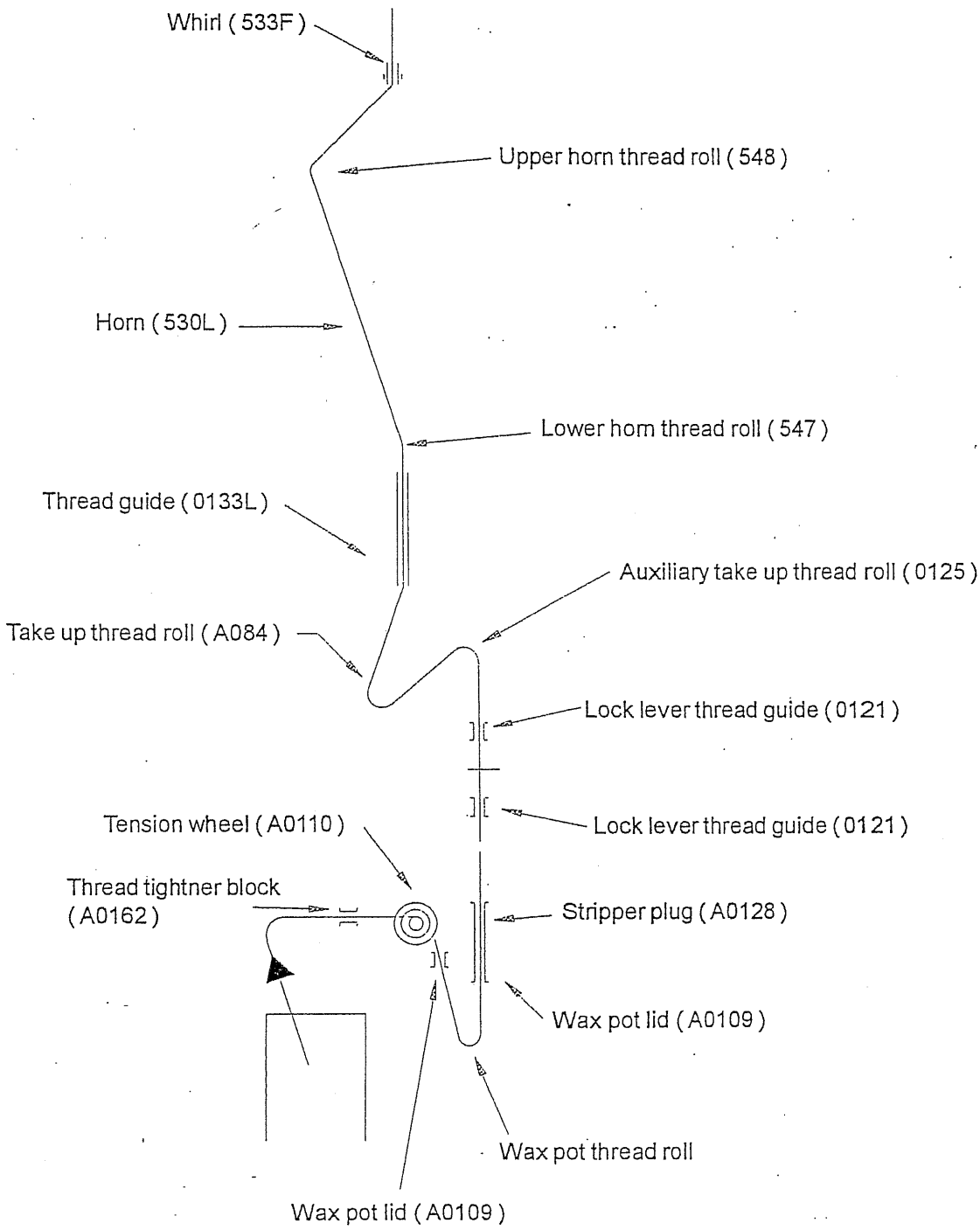
Warning:
On the front side of the sewing machine head is a small plate with the direction of the rotation for increasing or decreasing stitch length.



6.4.3.1. Adjustment of horn thread tension.

To set the tension, proceed as follows:

- Turn the MAIN SWITCH TO O POSITION and disconnect the machine cable from the electricity supply.
- Open the front door that protects the mechanical parts located on the machine base.
- Loosen the stripper plug (A0128)..
- Adjust the pressure panel until the desired tension has been reached.
- Bring the stripper plug back to its original position.
- Once the tension has been set, close the door.

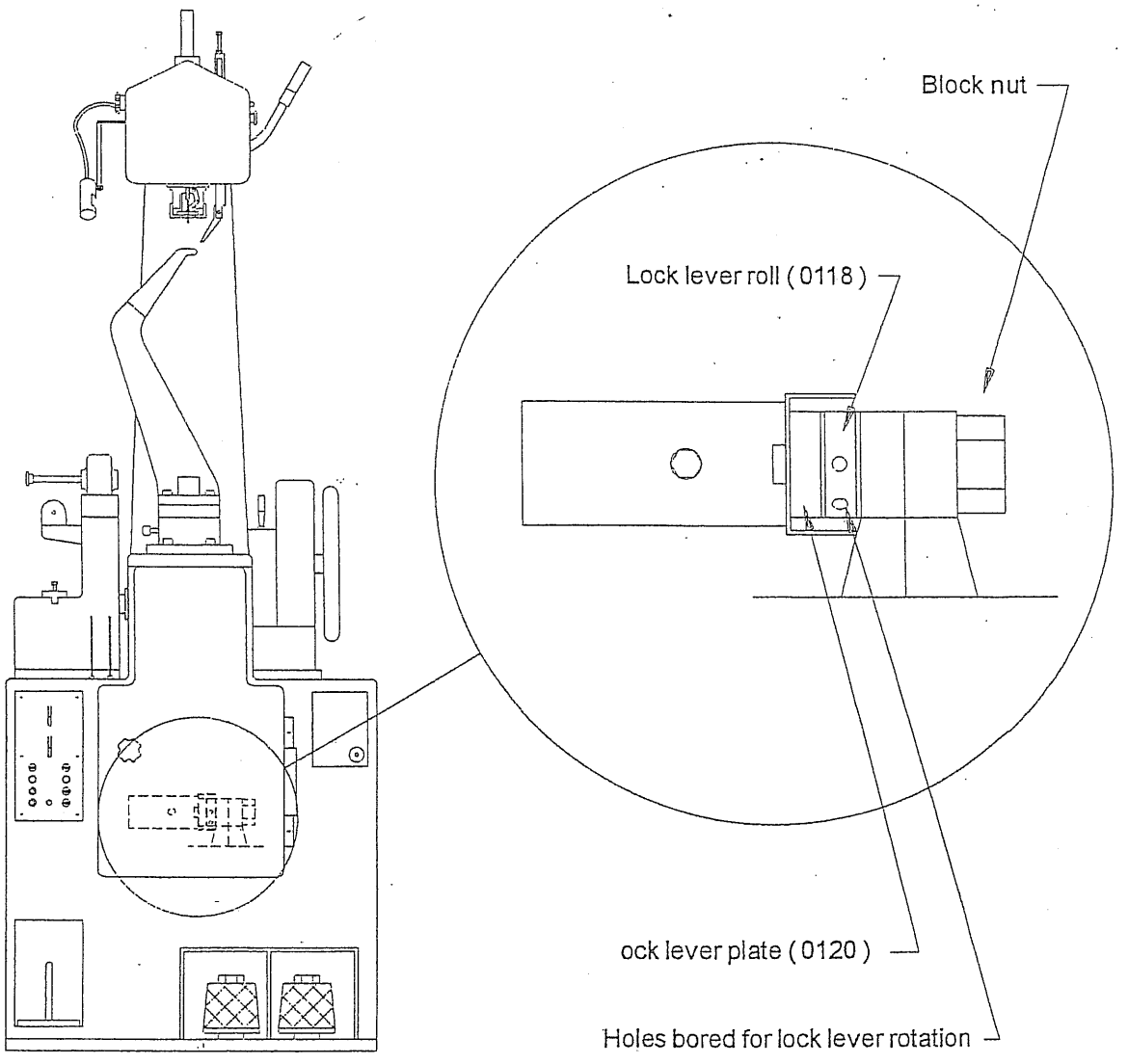

Whirl (533F)
Upper horn thread roll (548)
Horn (530L)
Lower horn thread roll (547)
Thread guide (0133L)
Auxiliary take up thread roll (0125)
Take up thread roll (A084)
Lock lever thread guide (0121)
Tension wheel (A0110)
Lock lever thread guide (0121)
Thread tightner block
(A0162)
Stripper plug (A0128)
Wax pot lid (A0109)
Wax pot thread roll
Wax pot lid (A0109)

6.4.6. Adjustment of thread braking system.

This is used in the case where it is necessary to change the thread with another of a different thickness.

For this reason, the thread brake block must be set as follows:

- Turn the MAIN MOTOR SWITCH TO O POSITION and disconnect the machine cable from the electricity supply.
- Open the front door.
- Turn the hand wheel manually in the direction indicated by the arrow until the two lock levers (0120) and (0119) come into contact, and stop the thread from running through.
- Loosen the K blocking nut of the lock lever on the right (0119).
- Screw the lock lever by inserting a pointed tool into the G holes bored on the head until the thread can run though when pulled very strongly.
- Block the lock lever nut.
- Close the door.

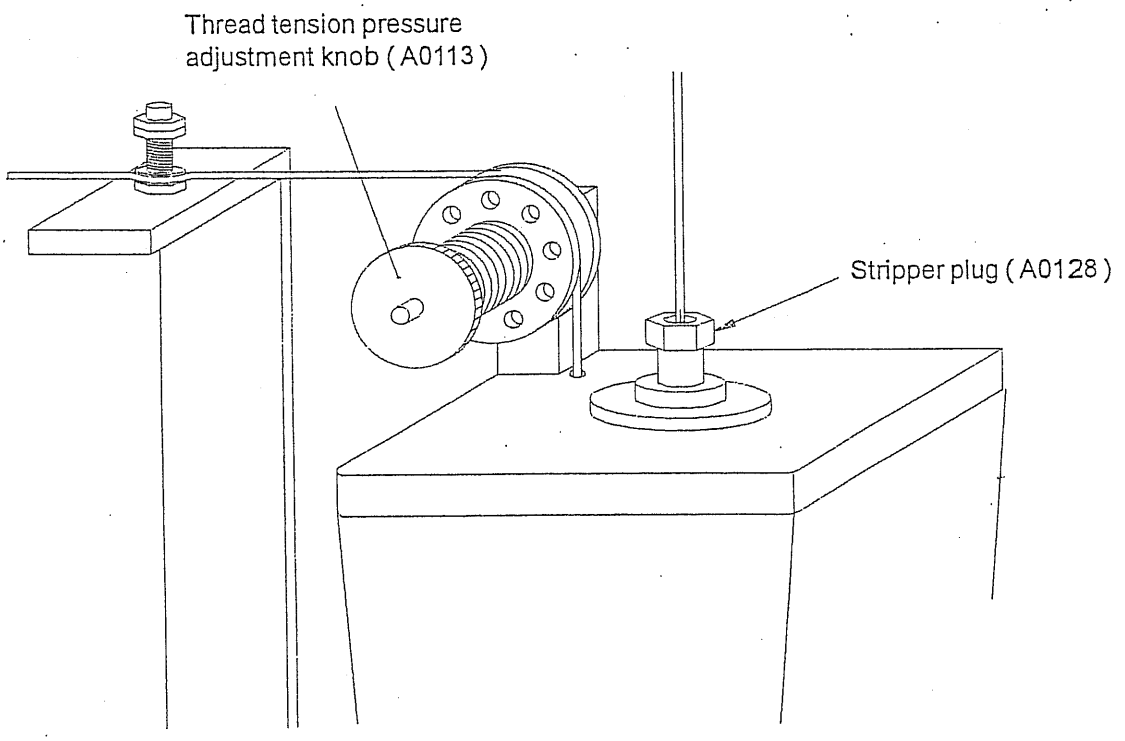


6.4.7. Thread tension setting.

Where the stitching seems not tight enough, turn the pressure setting knob (N° A0113) that tightens the thread towards the right.

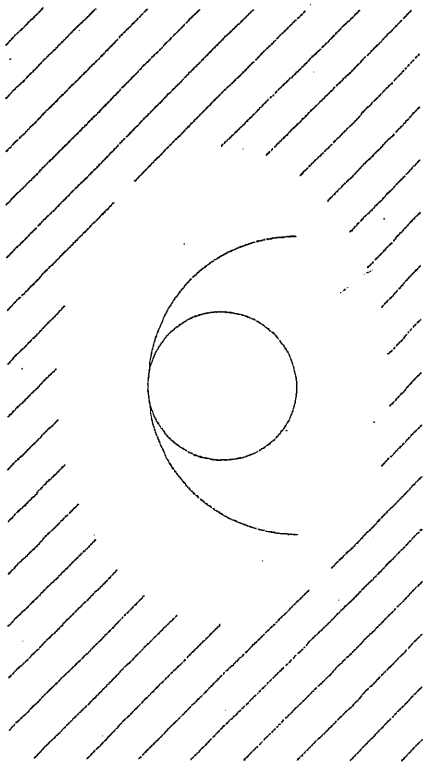
To carry this out, proceed as follows:

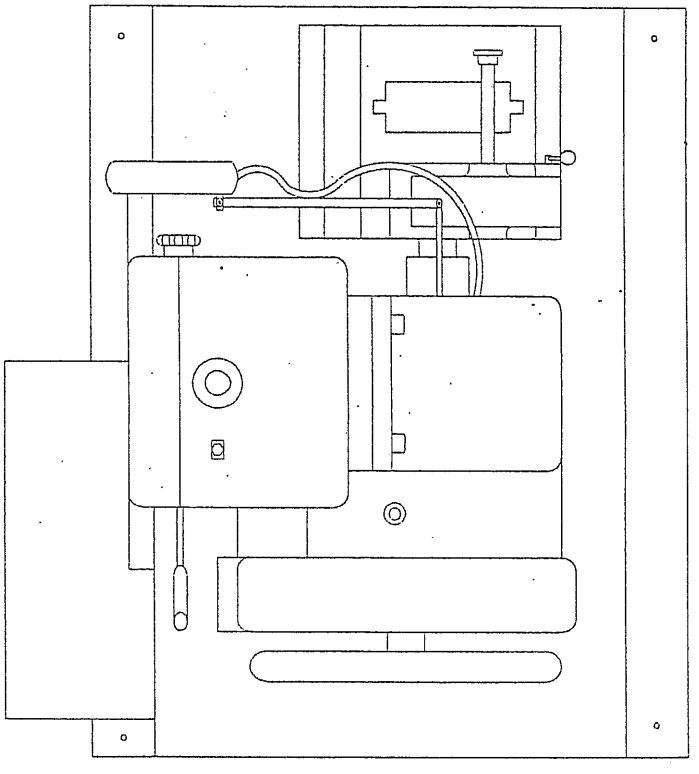
- Turn the MAIN MOTOR SWITCH TO O POSITION and disconnect the machine cable from the elctricity supply.
- Open the front door that closes the mechanical parts located in the machine base.
- Turn the setting knob until the desired tension has been reached.
- Bring the stripper plug back to its original position.
- Close the front door.



7 SETTING UP THE MACHINE READY FOR WORK

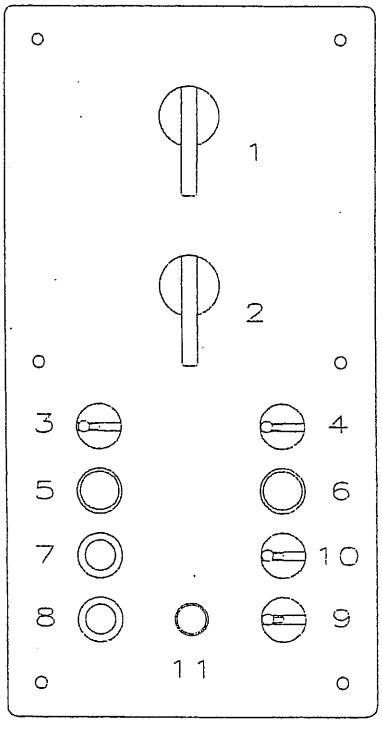
The machine has been designed with the control and work position in front of the elctrical control panel and the stitching area (needle and shuttle).
To ensure correct functioning and long life, the sewing machine should be used by an experienced operator.



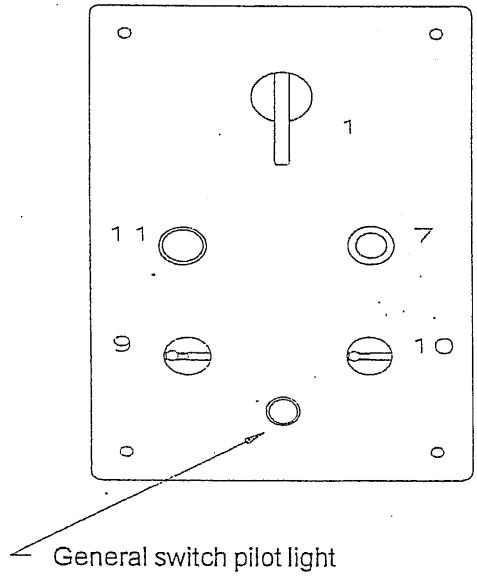


7.1. Electrical control panel

The electrical control panel is located at the work position on the right hand side of the machine base, seen from the control panel side. The electrical controls are located on a satined aluminium panel, fixed with 6 scre



Electrical panel without heating device



On the panel are the following electrical control commands:

Reference	Function

1 MAIN SWITCH - dual position switch

By turning the switch to position 1, all electrical parts on the machine will be connected to the electricity supply..

2 HEATING EQUIPMENT MAIN SWITCH (where present on the machine: three position switch)

On machines equipped with heating in the sewing and wax container areas, this switch will turn on the electricity for heating. Turning the switch to MAX position gives rapid heating before work begins. When the desired temperature is reached, switch to MIN to maintain correct working temperatures.

3 WAX CONTAINER HEATING SWITCH - (where present : dual position switch)

By turning the switch to position 1, the wax container will be connected to the electricity for heating.

4. SHUTTLE HEATING SWITCH - (where present : dual position switch).
The shuttle heating will be connected when the switch is on position 1.

5. PILOT LIGHT - green light - (where present)
This lights up when the the wax container heater is switched on.

6. PILOT LIGHT -green light (where present)
This lights up when the shuttle heater is switched on.

7 TRANSFORMER PROTECTION - Fuse container with 0.5A fuse
The fuse is placed to protect the 220/380 V heating equipment transformer.

8 TRANSFORMER PROTECTION -Fuse holder with 2A fuse (where present)
This fuse is placed to protect the 220/380 V heating equipment transformer.

9 INTERNAL LIGHTING - dual position switch
When turned to position 1, the inside of the machine base is illuminated.
(only if the general illumination switch is on position 1)

10 ILLUMINATION GENERAL SWITCH-dual position switch
This switch turns on the lighting when on position 1.

11 General pilot light - White light.
This light appears when the main switch in turned on (position 1).

Warning:
To switch on the work position lighting on the sewing machine head, turn the ILLUMINATION GENERAL SWITCH to position 1, and then turn on the lamp with its own switch.

7.1.1. Preparation of emulsion container.

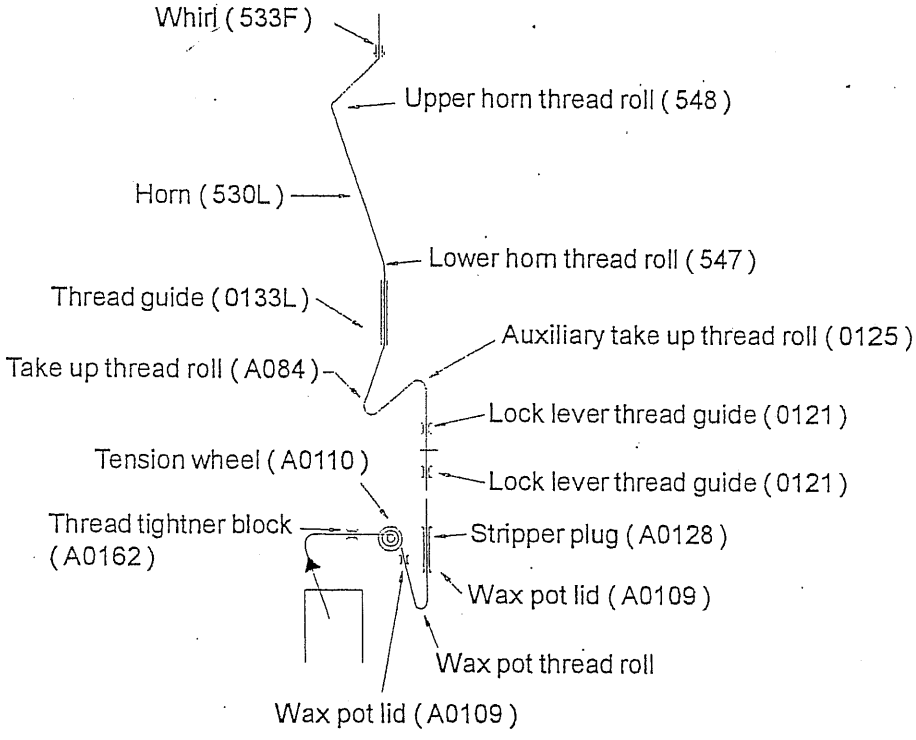
The container for the wax emulsion is located in the center of the machine base.
The liquid is composed of 3% wax in water.
To fill the container, proceed as follows:

- Turn the MAIN SWITCH TO O POSITION and disconnect the machine cable from the electricity supply.
- Open the front protection door.
- Slide out the container and fill it to the level indicated.
- Return the container to its original position.
- Close the protection door.

7.2. Machine threading system

7.2.1. Threading the horn

To carry out this operation, proceed as follows:
- Turn the MAIN SWITCH TO O POSITION, and disconnect the machine cable from the electricity supply.
- Open the door on the machine base using the handle provided.
- Place the bobbin full of thread in the correct housing, located in a niche in the lower right hand side of the base, as seen from the control panel side.
- Unwind the end of the thread from the bobbin and pass it through the threading guides according to the direction shown in the drawing.
- Open the front protective cover (N° 531) of the horn by pressing on the closing spring.
- Using the thread puller supplied with the machine, hook up the end of the thread which is now in the base, and pull it through the hole in the base of the horn.
-Pass the thread through the two holes in the lock lever thread guide, threading guides in the horn and the side hole of the whirl (N°533)
- Tie the end of the thread to the spring on the side of the horn.
- Close the door.


Whirl (533F)
Upper horn thread roll (548)
Horn (530L)
Lower horn thread roll (547)
Thread guide (0133L)
Auxiliary take up thread roll (0125)
Take up thread roll (A084)
Lock lever thread guide (0121)
Tension wheel (A0110)
Lock lever thread guide (0121)
Thread tightner block (A0162)
Stripper plug (A0128)
Wax pot lid (A0109)
Wax pot thread roll
Wax pot lid (A0109)

Warning:

1) *In order to avoid thread blockage during sewing operations, lubrify the thread guides and runs from time to time.*

2) To replace the thread on the horn when the bobbin is empty, place a new bobbin in the correct housing, and take the end of the thread, carrying out the operation described above, once more.

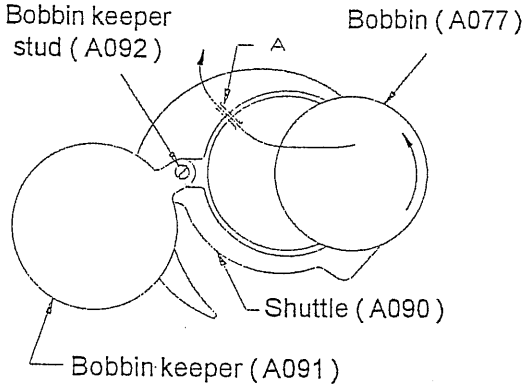
Rule for correct functioning:
- As indicated on the small plate in front of the operator on the sewing column, for the horn, use good quality right twisted thread or polyester thread.

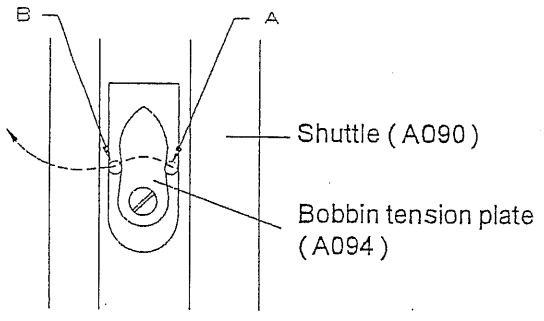
7.2.2. Threading system for the shuttle.

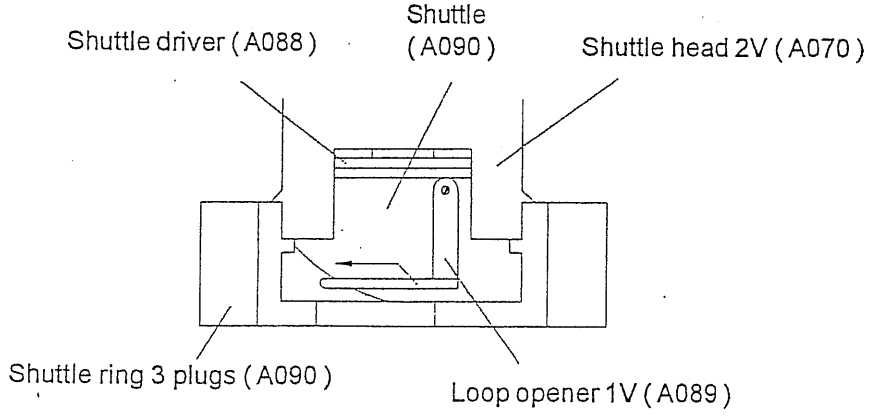
Attention : the mechanical parts that need to be touched for loading the spool may reach high temperatures on machines with spool heating systems, therefore it is extremely important to take care during this operation, and to use adequate protection.

To make it easier to find the correct insertion position between the shuttle driver (A088) and the shuttle, (A090), proceed as follows:

- Turn the MAIN SWITCH TO O POSITION and disconnect the machine cable from the electricity supply.
- Rotate the hand wheel manually in the direction shown by the arrow until the shuttle turns completely to the left, leaving the loop opener (N° A089) sticking out.
- Unscrew the shuttle retaining nut(N° A073) of the shuttle ring.(N° A072).
Turn the shuttle ring to the right, and push downwards, sliding it out from its holder.
- Remove the shuttle from the ring which is now ready for the spool/bobbin to be inserted.
- Using the screwdriver, press on the head of screw (N° A092) located on the inside face of the shuttle, and with the cover (N° A091) raised, pull it aside to leave an open space for inserting the bobbin.
- Insert the thread in the small hole, A, on the rounded wall.
- Insert the bobbin so that when the thread is pulled, the bobbin turns in an anti-clockwise direction. Close the shuttle replacing the cover in its original position.
- Wind the thread around the small spring (N° A094) and then pass it underneath the spring; now insert the thread in the second small hole, B.
- Check that the thread runs smoothly without blocking.
- Re-insert the shuttle in the shuttle ring.
- Replace the shuttle ring in its housing.
- Turn the shuttle ring blocking screw back to its original position.







Warning:

1) Machine threading must always be carried out with the motor switched off, with MAIN SWITCH IN O POSITION, and the machine cable disconnected from the electricity supply.

2) The upper part of the machine where the shuttle is located, is heated to facilitate correct stitching and can reach a high temperature.

3) Before starting the production cycle, wait till the shuttle has reached the correct working temperature, if present on the machine.

4) Never start up the machine without having previously placed the article to be stitched in position between the presser foot and the tip of the horn.

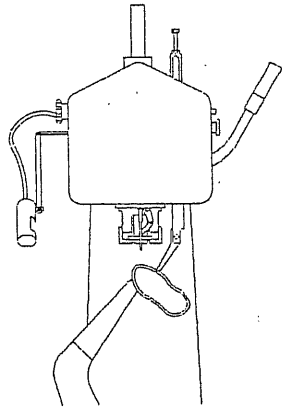
5) In all cases, the operator should never intervene in the stitching zone (needle-shuttle) for repairs and maintenance without switching off the machine beforehand (MAIN SWITCH IN O POSITION) and without disconnecting the machine cable from the electricity supply.

6) When the bobbin is empty, to replace the shuttle thread, carry out the operations described above, remembering to replace the empty bobbin with a full one.

Rule for correct functioning:
For the spool, any type of thread can be used, as long as it is a strand thicker than the horn thread.

7.3. Positioning of the article to be stitched.

The article to be stitched must be placed between the tip of the horn and the presser foot.



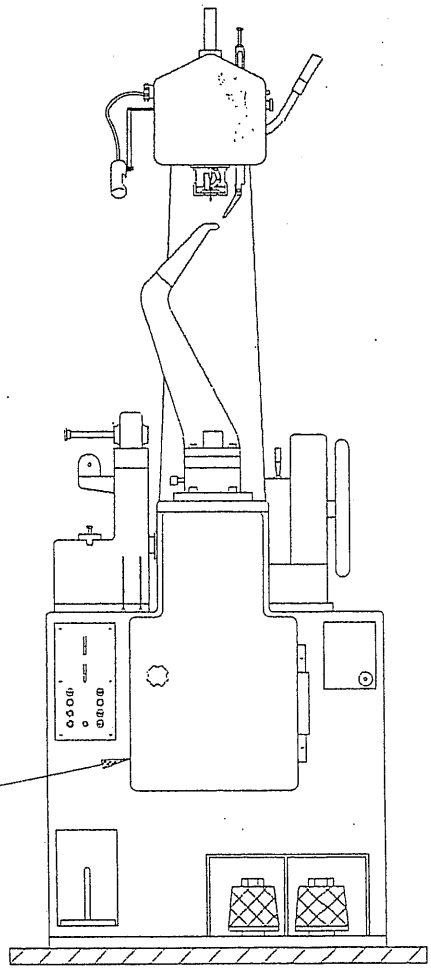
7.4 *Replacement of illumination light.*

The sewing machine is equipped with two illuminating lights:
- one sends a light beam onto the stitching area,
- one lights up the inside of the machine base.

To replace, unscrew the lamp from the socket and replace with a new lamp.

7.5 Microswitch positions.

There is a safety microswitch on the protective door on the machine base.
If this protective door is not closed, the machine will not function.



Microswitch control on motor door opening

8 *MACHINE USE.*

Conditions necessary to permit the machine to function.

1) The horn thread must be at least 10 cms long when it has passed through the blocking spring.
2) The spool thread must be at least 10 cms long after passing through the shuttle.
3) Sewing operations must always begin with the horn turned towards the left.
4) To start sewing again with the horn turned towards the right, the thread must be passed under the tip and blocked by the spring: if this operation is not carried out, the needle will not raise the thread.

8.1. Description of function - action - consequence cycle.

The functioning sequence proceeds as follows:

1) Turn on the MAIN SWITCH located on the right hand side of the machine.

2) Raise the presser foot (N° A065) by pressing the presser foot pedal (N° A0183) or by working the lever (N° A035).

3) Position the article to be stitched between the horn tip and the presser foot.

4) Make sure that the presser foot sits in the guiding groove on the shoe.

5) Press the motor clutch pedal (N° A0182).

—> the clutch is let in,
—> the motor will transmit to kinematics,
—> the operator can begin stitching

6) Once sewing is finished:
Release the control pedal —> the clutch will be on —> the sewing mechanism will stop.
By turning the small bakelite wheel on the right hand side of the machine, raise the needle if necessary, attatch the end of the thread from the horn tip to the spring on the side of the horn.

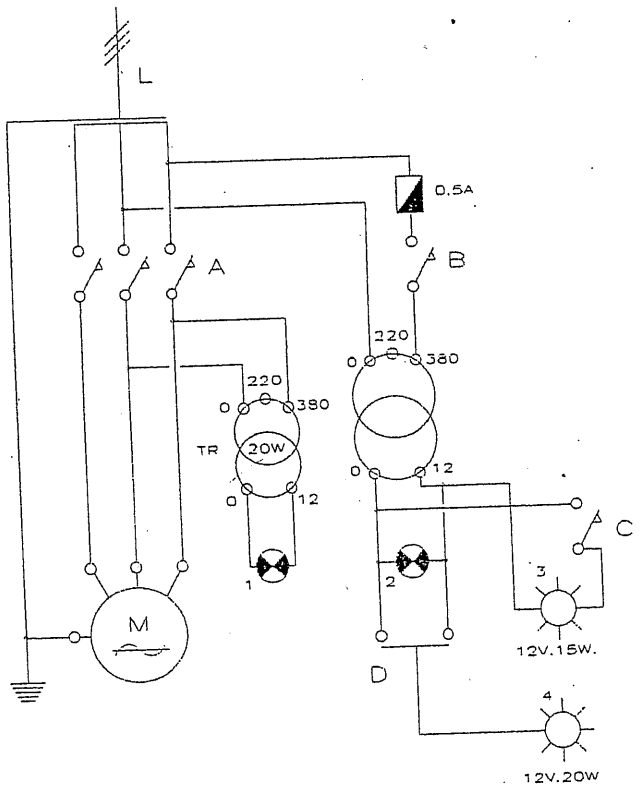
7) To begin a new sewing operation, repeat the sequence described above.

Warning:

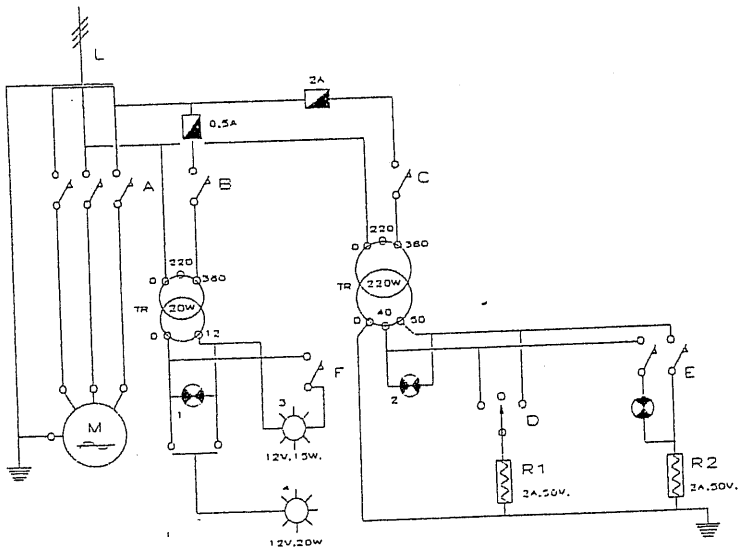
- The brake and the clutch meshing which are used during the start-up or stopping of the sewing operation, are placed on an axis with the main motor and form a single block with the motor.

8.2 ST 90 , electrical layout drawing

Electrical layout drawing without heating equipment.



Electtrical layout drawing including heating equipment.

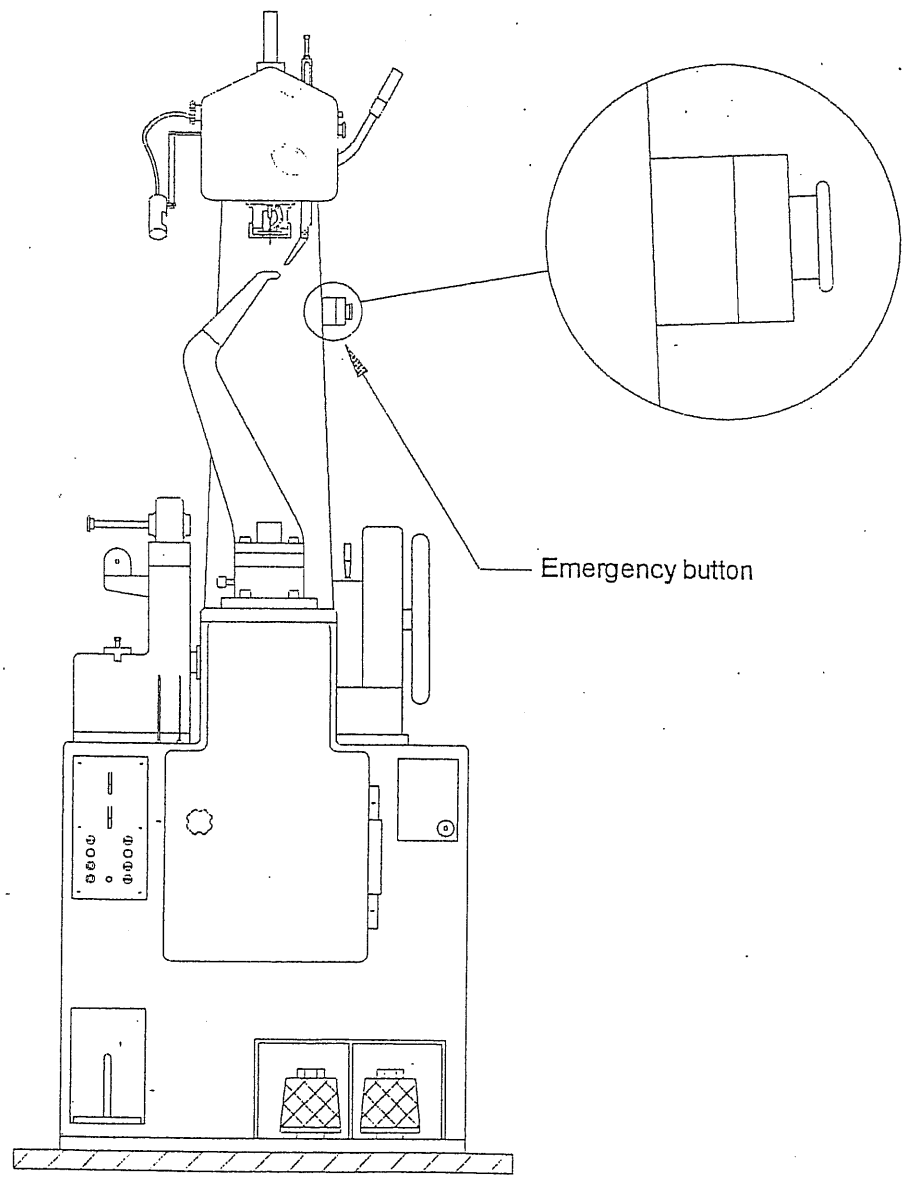


Warning:

1) To stop the work sequence immediately at any time, press the red EMERGENCY button located on the front of the machine base at the top, on the left as seen from the control panel side. This button will cut off the electricity from the motor. To start up normal working functions again, turn the red emergency button in a clockwise direction. The braking system on the button will be released and it will return automatically to rest position.

2) While the machine is working, it is absolutely forbidden to remove the protective systems that have been installed by the manufacturer as safety precautions agianst injury to the operator.

3) It is extremely important that the operator pay maximum attention during sewing operations. Since it is impossible to install safety protection in the sewing area (needle - shuttle) the operator must use eye protection. Operators are strongly advised to use the machine correctly, avoiding any lack of attention, and taking a rest when tired.
Extreme care must be taken in the spool heater area, and on the machines with wax containers, near the wax heating area.
When the motor is switched on it is very important to take care not to press the motor pedal by mistake.



9 REPLACEMENT OPERATIONS.

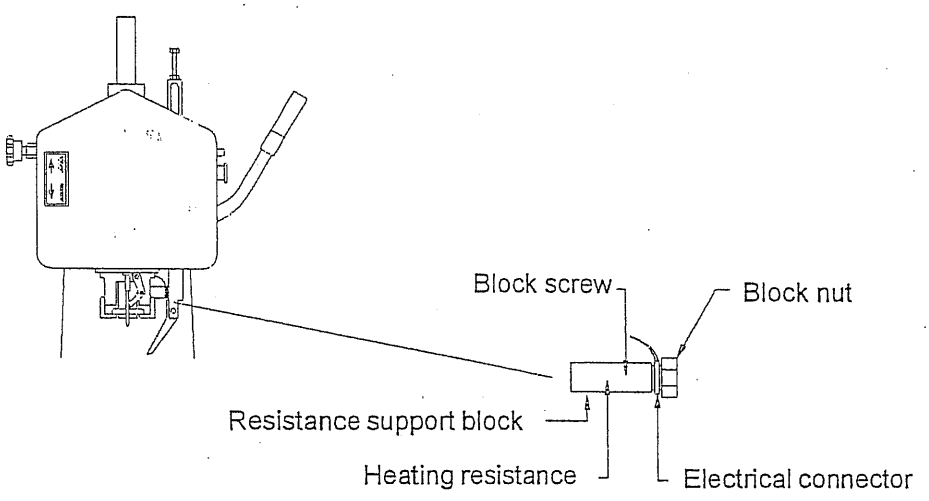
<u>If the machine is equipped with wax container and shuttle heating</u>

9.1 Replacement of shuttle heating resistance.

To replace the resistance, proceed as follows:

- Turn the MAIN SWITCH TO O POSITION, and disconnect the machine cable from the electricity supply.
- Disconnect the terminal block.
- Eliminate the blocking action produced by the headless screw, by loosening the pin that is screwed into the threaded hole in the back part of the bobbin holder support .
- Slide out the heater resistance.
- When this is completed, the operator will find the resistance in his hand.

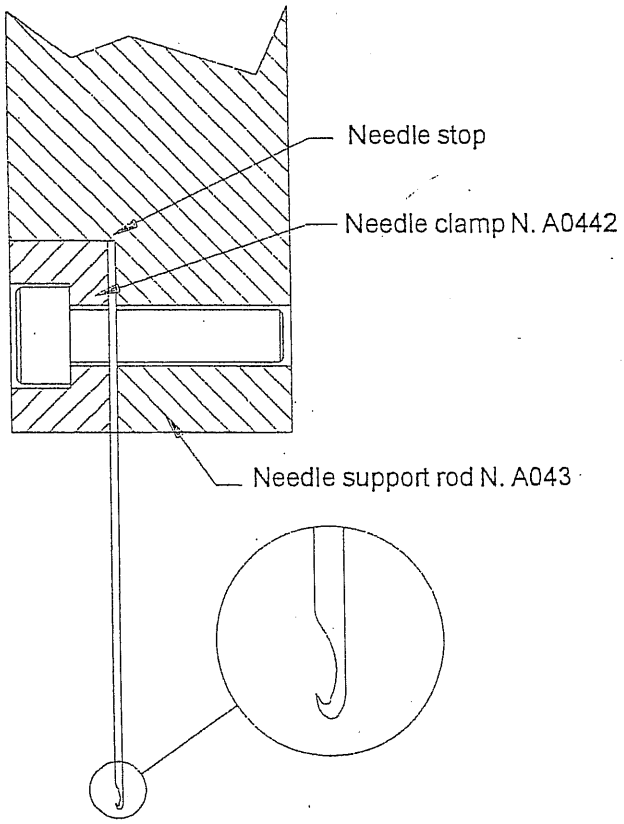
- To mount a new resistance, proceed as follows:
- insert the new resistance.
- block the headless screw.
- reconnect the terminal block.

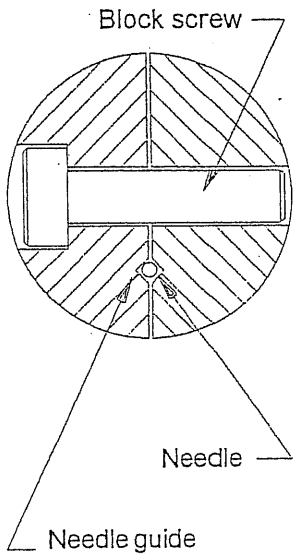


9.2 Replacement of threading needle.

To replace, proceed as follows:

- Turn the MAIN SWITCH TO O POSITION and disconnect the machine cable from the electricity supply.
- Turn the small wheel in the direction shown by the arrow to lower the needle bar (A043) that holds the needle clamp (A0442).
Loosen the blocking screw of the needle clamp.
- Remove the used or damaged needle.
- Replace with a new needle , pushing it as far as possible into the seat to make sure it is placed correctly, and checking that the barb is turned towards the right and the presser foot.
- When the needle has been correctly placed in position, tighten the blocking screw .





Warning:

Further information concerning needles and their mounting.

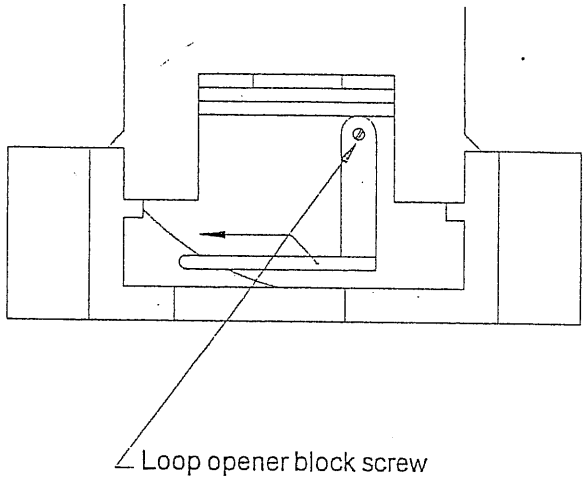
Use needles that correspond to the size of the thread employed:

THREAD STRANDS	NEEDLE N° - ART 4002 HL.
4	3
5	4 - 5
6	5 - 6
7	6

9.3 Loop opener replacement.

To replace the loop opener, proceed as follows:

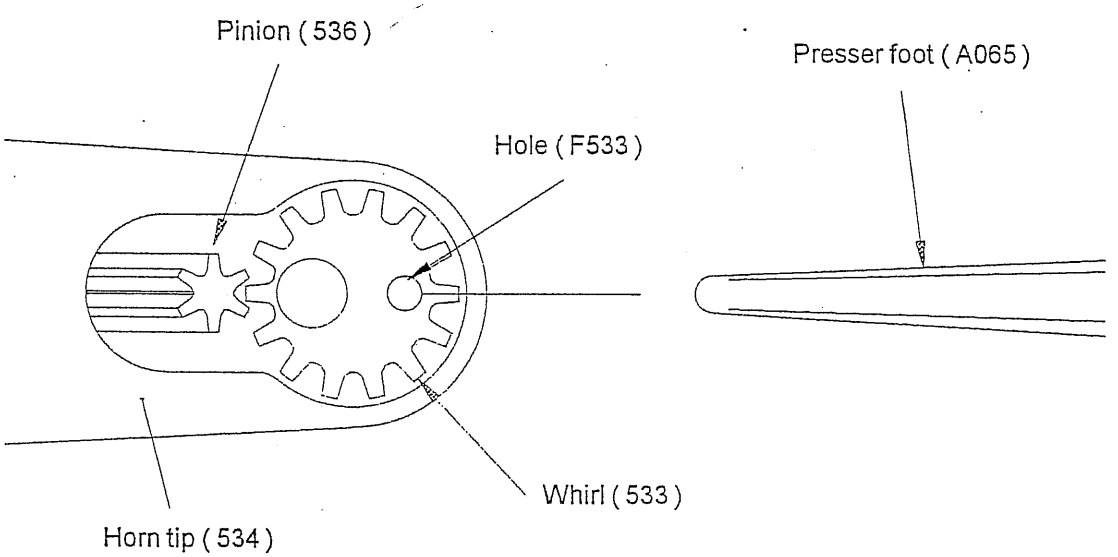
- Turn the MAIN SWITCH TO O POSITION and disconnect the machine cable from the electricity supply.
- Turn the small wheel till the position in the drawing has been reached.
- Unsrew the blocking nut..
- Remove and replace the used or damaged loop opener (N° A089)
- Tighten the blocking screw.



9.4 Whirl replacement and setting adjustment.

To replace the whirl, proceed as follows:

- Turn the MAIN SWITCH TO O POSITION and disconnect the machine cable from the electricity supply.
- Turn the small wheel in the direction shown by the arrow and place the point of the loop opener (N° A089) forwards and to the left..
- Unscrew the 2 fixing screws from the horn cap (N° 535) and remove the cap.
- Remove the whirl from its housiing , and insert the new whirl. taking care to position the small internal hole (F 535) , turned towards the right, in the direction of the presser foot.
- Push the loop opener point towards the horn, taking care to set the cogs of the rotation movement correctly.
- Turn the hand wheel manually, making sure that during rotation, the whirl winds the thread around the needle barb.
- Replace the horn cap (535).



9.5. Pinion replacement.

To replace the pinion, proceed as follows:

- Turn the MAIN SWITCH TO O POSITION and disconnect the machine cable from the electrical supply.
- Remove the pinion (N° 536) to be replaced, and insert the new pinion in its place.
- Turn the horn slightly, pushing the pinion downwards so that it fits into the correct position perfectly, and re-assemble the rest of the tip.
- If the rotation between the pinion (N° 536) and the whirl (N° 533) is forced , remove the horn cover rear (538) on the horn elbow and gradually unscrew the threaded pinion adjusting screw (540) until rotation movement is completely free.

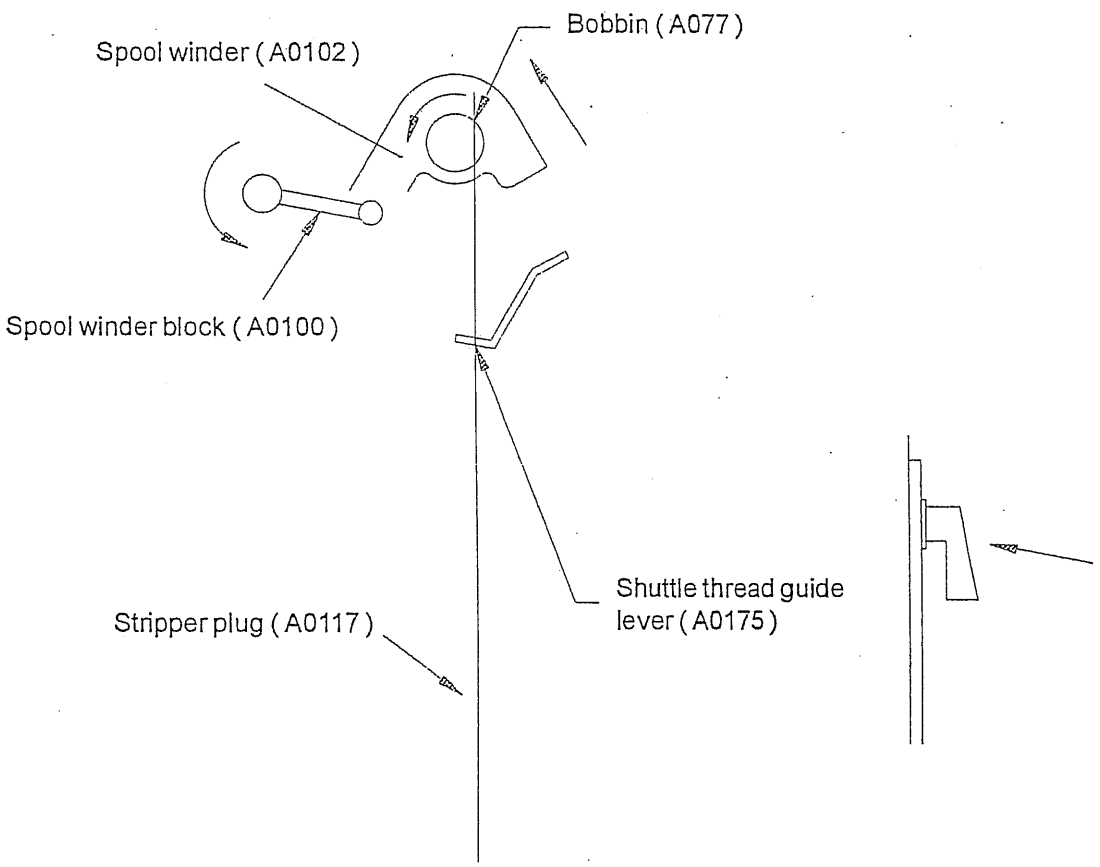
10 ACCESSORIES

10.1 Preparation of the shuttle spool using the spool winder.

On delivery to the customer, the machine is already prepared with a length of thread which shows the various passages the thread must follow to reach the spool winder.

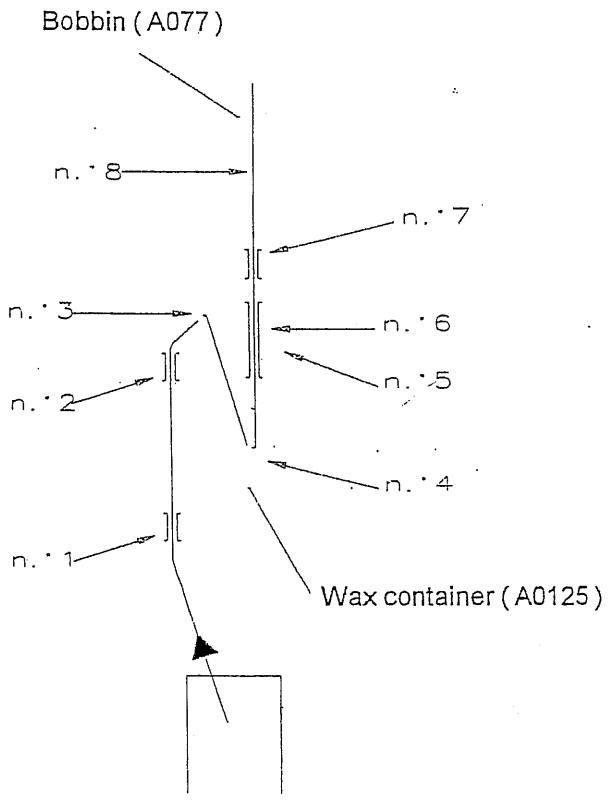
To carry out this operation, proceed as follows:

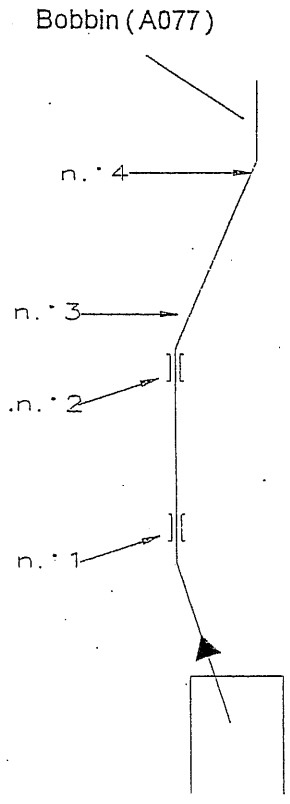
- Unscrew the stripper plug (A 0117).
- Tie a knot in the end of the thread attatched to the spool.
- Open the thread above the knot, and pass the thread of the new skein inserted among the strands of the old thread for about half a meter.
- Take the end of the thread, after having untied it from the spool winder shaft, and pull through until the new thread has passed completely.
- Where sewing is carried out using the heated wax container, or liquid wax, it is adviseable to set the stripper plug until the thread to be wound on the spool comes out wax, but clean.
- If there is difficulty in passing the thread, it must be pulled manually through the tighter passages.
- Take care not to let the skein of thread run out completely.



10.2 Wax container.

When the machine is equipped with a wax container, before using the thread, it must be dipped in the wax and then wound on the spool using the spool winder.
To wax soak the thread, pass the thread along the same route as shown in the drawing in paragraph 7.2.1.





WARNING:

Once the container has been filled with pieces of solid wax, turn the WAX CONTAINER HEATER switch to MAX position, and once the wax is melted, turn to MIN position to maintain the wax at correct temperature for working.
- When using wax, it is adviseable to set the SHUTTLE HEATER thermoregulator to 50 - 50° C.

Attention:
High temperatures are reached near the wax container, therefore the operator must be very careful, using gloves and other protection where necessary.

10.3 Spool winding

See drawing in paragraph 10.2.

In order to rotate the spool winder shaft (A 0103), the protection (A0102) on the winding block must be raised ; in this position, block the handle (A 0100).

1) Turn the MAIN SWITCH TO O POSITION and disconnect the machine cable from the electricity supply.
2) Insert the bobbin (A 077) and block it with the knurled knob (A 0104)
3) Make sure that the thread passes between the two pins of the thread guide lever (A 0175)
4) Wind the thread twice around the bobbin.
5) Turn on the motor switch; by shifting the lever from right to left and vice-versa, the bobbin will be wound full.
6) To regulate the amount of wax for thread coating, if the thread is too dry, the stripper plug (A 0117) must be loosened, and tightened if there is too much wax on the thread.
7) When winding is completed, lower the protection again, thus stopping the shaft rotation.
8) Turn the spool switch on (where present on the machine) to MAX position; place one of the waxed spools on the little pot behind the shuttle block. This way the spool will be heated correctly for good stitching results.

After the spool heater has reached correct working temperature, turn the switch to MIN position to maintain this temperature for sewing operations.

In order to limit high noise emission on the ST 90 the manufacturer has employed special anti-boom materials inside the machine.

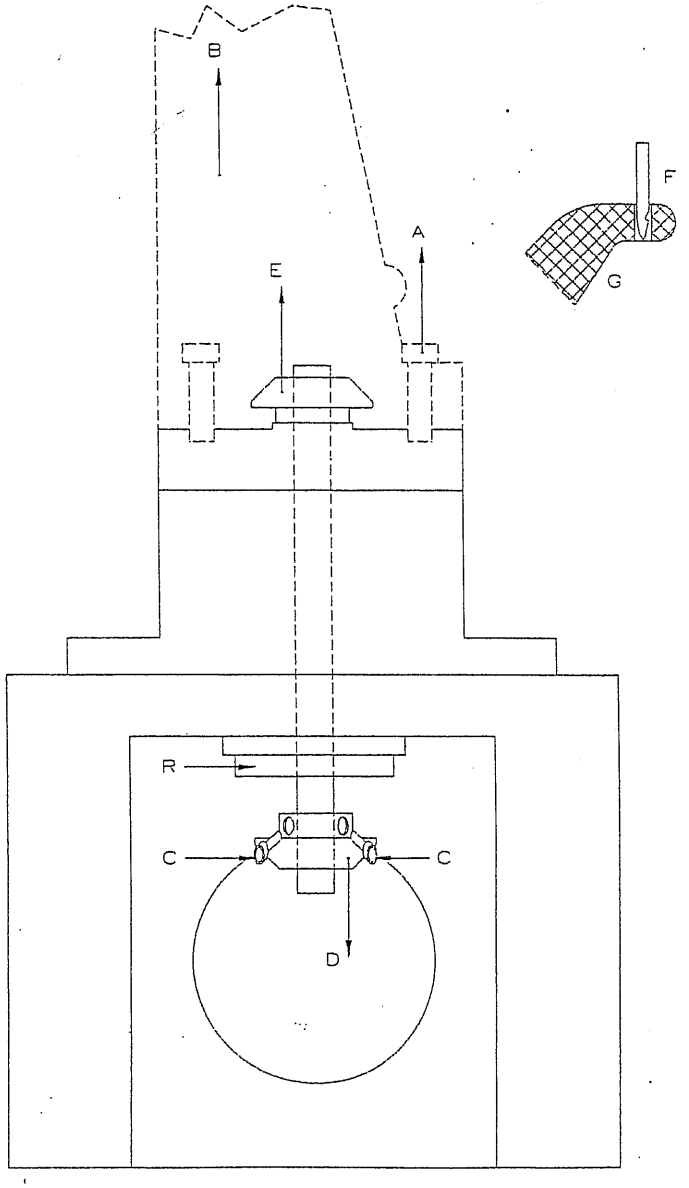
THE NOISE EMISSION LEVEL IS REMARKABLY UNDER THE 80 dB(A) LEVEL ESTABLISHED BY DIRECTIVE

11 USE OF THE ST 90 WITH HORN FOR OPANKA STITCHING.

11.1 Replacement of the Blake stitching horn with the Opanka horn.

To replace, proceed as follows:

- Unscrew the horn screws and remove the horn.
- Unscrew the C screws from the D gear and slide out the shaft.
- Position the shaft with the gear (N° 570 MV)
- Replace the D gear, moving it a little to place it in position, and tighten the C screws.
- Place the Opanka horn with the oil hole turned toward the operator , centering it with the needle, and tighten the screws strongly.
- Re-set the whirl.



12 REPAIRS AND MAINTENANCE.

12.1 Maintenance

Correct maintenance is a very important factor to ensure long life, good working order, and top performance, as well as to guarantee the safety precautions envisaged by the manufacturer.

Normal maintenance schedule

Operation	Machine part	Regularity
Lubrification	All points visibly marked with red paint	once a week
	Inside the shuttle before inserting the spool	at each spool change
	Whirl, a few drops of oil through the plate hole	once a day
	Horn, removing cover (N°538) on elbow	once a month
Greasing	Cams, rollers, pins, and runner guides	once a week
Visual condition check	Pneumatic tubing and connections	once a week
Control check	EMERGENCY button function	each production start up.

12.2 Operations which must be carried out by qualified personnel

Below is a list of all the maintenance operations that require technical competence, and which must be carried out by qualified personnel.

The user must for no reason carry out any of the following operations.

- Replacement or repairs to any transmission parts
- Replacement of any seals or gaskets.
- Replacement of any electrical components.
- Opening of the elctrical control panel, and/or intervention with any electrical parts.
- Adjustment of the shuttle position.
- Adjustment of the thread-puller position.
- Dis-assembly and re-assembly of the shuttle holder support.
- Adjustment of presser foot using the levelling screws on the sewing heat.

12.3 Problems which can arise with the ST 90 sewing machine.

Problem:

Horn thread breakage:

- the thread is of low quality
- the thread is too tightly blocked; Unscrew the tension wheel adjusting nut (A 0113).
The lock lever plates (0120 and 0119) are blocking the thread completely instead of letting it pass through (though it must must not pass easily).
- damaged needle, or needle too small for the thread employed.
- thread blocked in one of the guiding passages.
- whirl hole damaged or too sharp.
- scratches on the horn cap : eliminate with fine emery cloth.

Problem:

Thread breakage or missing stitches.

Solution:

- Replace the needle if not perfectly straight.
- Check that the hook of the loop opener coincides exactly with the center of the needle, and the thread runs easily through all guides and eyelets. If necessary, lubrify the thread guides.
- Check that no marks or scratches have been left on the horn cap by the needle . if so, eliminate all scratches with a fine emery cloth.
- Check the condition of the whirl. If the whirl is worn, the small hole for passing the thread will have become sharp, and could cut the thread.
- File and smooth, or if necessary, replace the whirl.

12.4 Parts subject to wear and tear.

Below is a list of the parts that are subject to wear and tear, and which need to be replaced. It is adviseable to keep a stock on hand.

Quantity	Machine part	Code number
2	Presser foot lift and hold down racks	A053 - A054
1	Spring	A037
1	Loop opener	A089
1	Thread lifting finger	A079
1	Horn tip	534
1	Horn cap	535
1	Pinion	536
1	Whirl	533

In order to limit high noise emission on the ST 90 the manufacturer has employed special anti-boom materials inside the machine.

THE NOISE EMISSION LEVEL IS REMARKABLY UNDER THE 80 dB(A) LEVEL ESTABLISHED BY DIRECTIVE

12.5 Equipment supplied with the machine

Quantity	Machine part
1	Pinion
1	Whirl
5	Needles 4002 HL
6	Bobbins
1	Presser foot
1	Presser foot for rubber
1	needle clamp screw
2	Horn cap screws
1	Loop opener
3	Threads for machine threading
1	Steel brush
1	Oil can
1	Screw driver
3	Hexagonal screw spanners (2, 3, 5)
1	T spanner (4)
1	0.5A fuse
1	2A fuse
4	wrenches (6/7 - 8/10 - 12/13 - 14/17)
1	catalogue
1	Block of solid wax (only for machines with heating system)
	Oil emulsion.

13 DEMOLITION INSTRUCTIONS FOR THE ST 90 MACHINE

Whenever and for whatever reason the machine is to be eliminated and demolished, certain basic rules must be observed to safeguard public health and the environment in which we live.

- Eliminate even the samllest traces of oil and grease on the machine: lubrifying substances should not be left free in the environment, but should be recovered or treated by a plant specialised in the elimination of these products.

- All sheathes, flexible piping, and any plastic materials , or non-metallic materials should be dismantled and eliminated separately.

- Pneumatic and electrical components such as valves, electrovalves, pressure regulation equipment, switches, transformers, etc. must be dismantled for re-use if still in good condition, or if possible, checked and re-cycled.

- The body and all metal parts of the machine must be dismantled and grouped according to material type. This way the various parts can be dismantled and melted down for recycling.

15 MAIN WARNINGS

1) Protection systems have been provided by the manufacturer to protect the operator's safety during work operations.
These protections must absolutely not be removed while the machine is working.
It is extremely important that the operator take maximum care when using the machine, during all work operations. Since it is impossible to place a protection in the sewing area , both for high temperatures, and in the needle-shuttle area, the operator is strongly advised to take great care to pay attention while working, and to stop and rest if tired.
Extreme care should also be taken in the spool heater resistance area, and where the machine is equipped with a wax container, in this area as well.
When the main motor is switched on, be very careful not to use the pedal for sewing speed by mistake.

2) Make sure the that the blocking system on the right hand side of the sewing head which serves as a mechanical protection for the presser foot lift bar, is positioned correctly. Without this protection, when the motor is running(see drawing) it could break the lift bar if it rotates in the opposite direction.

If the machine is to be used for any operations that were not intended by the manufacturer, or for any intervention to be made to the machine, the user must absolutely contact the manufacturer for advice on any danger or injuries that could be provoked by incorrect use of the machine.

4) Whether the machine is placed on a pallet, or whether it is shipped in an open or closed wooden crate, all handling and transport must be carried out in an adequate manner.

5) For correct machine function, if the floor is not perfectly flat, place levelling feet under the machine. Moreover, to ensure perfect machine stability, it is advised to place a rubber square of 4 to 5 mm thick under each corner.

6) It is adviseable to protect the user's main electricity line from any overloading, by providing safety switches (magnetothermal switches).

7) Where the supply voltage of the machine is not the same as that of the user's factory line, the connections to the transformer and main motor and spool motor terminal blocks must be changed. The electrical installation supply transformer is located in a special housing in the machine base: to have access, remove the electrical control panel, by removing the 6 fixing screws.

8) To avoid thread blocking during sewing operations, lubrify the thread guides and eyelets from time to time.

9) The lower part of the thread path passes through the emulsion container. This container can be removed: to facilitate threading in this area, lower the container using the knob on the right hand side of the container.
For best working conditions, the emulsion in the container should be 3% oil in water.

10) For the horn, good quality right twisted thread or polyester thread is recommended.

11) Machine threading must always be carried out with the machine stopped, and with the MAIN SWITCH IN O POSITION , as well as the machine cable disconnected from the electricity supply.

12) The upper part of the machine near the shuttle can reach high temperatures when heated.

13) In the area near the wax container, the temperature can be very hot. Maximum attention must be paid when working in this area, and it is necessary to wear gloves and other protection.

14) Before beginning a work cycle, wait until the shuttle has reached the correct temperature set on the SHUTTLE HEATER thermoregulator located on the electrical control panel.

!5) Never start up the machine without having first placed the article to be stitched in work position between the presser foot and the horn tip.

16) Operators must never intervene in the needle-shuttle area for maintenance without first switching off the machine. (MAIN SWITCH IN O POSITION) and after having disconnected the machine cable from the elctricity supply.

17) For the spool, any type of thread can be used as long as it is one strand thicker than that used on the hom.

18) To stop the machine immediately at any time, press the red EMERGENCY button located on the front of the machine base, on the upper left hand side, as seen from the control side. This button cuts off the electricity from both motors. To start up the machine again, turn the red emergency button in a clockwise direction: the braking system will be released, and the button will return to its original rest position.

19) While the machine is working, it is absolutely forbidden to remove any of the safety protections provided by the manufacturer for the operator's safety.

All rights reserved.
The reproduction of this manual is prohibited, even partially, and in any form whatsoever, (printed, photocopied, microfilmed, or other methods) as well as by computer processing, reproduction or diffusion using electronic means.

RADO | Spare Part List

Typ: Stitching Machine | For Drawing: E 85.96.01.00.04

Main Group: ST 90 MAXI HORN | Sub Group:

Item	Text	Reference No.:	
A 01 L	Base	96.01.01.09	
A 02 L	Column	96.01.02.09	
A 03	Head	96.01.03.09	
A 04	Head cover	96.01.04.09	
A 05	Set cams - 2 V	96.01.05.09	
A 06	Cam shaft	96.01.06.09	
A 07	Gear - 2 V	96.01.07.09	
A 08	Shuttle cam lever pivot pin	96.01.08.09	
A 09	Needle cam roll stud - 1 D	96.01.09.09	
A 010	Cam pin	96.01.10.09	
A 011	Presserfoot cam lever spring	96.01.11.09	
A 012	Shuttle cam lever	96.01.12.09	
A 013	Shuttle cam lever roll stud	96.01.13.09	
A 014	Shuttle cam lever roll	96.01.14.09	
A 015	Feed cam lever	96.01.15.09	
A 016	Presserfoot cam lever	96.01.16.09	
A 017	Shuttle cam lever block	96.01.17.09	
A 018	Feed cam lever spring connecting stud	96.01.18.09	
A 019	Feed cam lever roll stud	96.01.19.09	
A 020	Feed cam lever roll	96.01.20.09	
A 021	Presserfoot cam lever pivot stud	96.01.21.09	
A 022	Presserfoot cam roll	96.01.22.09	
A 023	Presserfoot cam roll stud	96.01.23.09	
A 024	Presserfoot lifting dog pivot stud - 1 V	96.01.24.09	
A 025	Presserfoot lifting dog	96.01.25.09	
A 026	Pressurefoot lifting dog retaining collar - 1 V	96.01.26.09	
A 027	Retaining collar spring	96.01.27.09	
A 028	Retaining lever spring connecting pin	96.01.28.09	
A 029	Rack guide	96.01.29.09	
A 030	Support for shuttle cam lever pivot pin - 2 V	96.01.30.09	
A 031	Shuttle drive rack	96.01.31.09	
A 032	Feed cam lever connecting arm	96.01.32.09	
A 033	Pivot stud for A032	96.01.33.09	
A 034	Stitch length adjusting screws - 1 D	96.01.34.09	

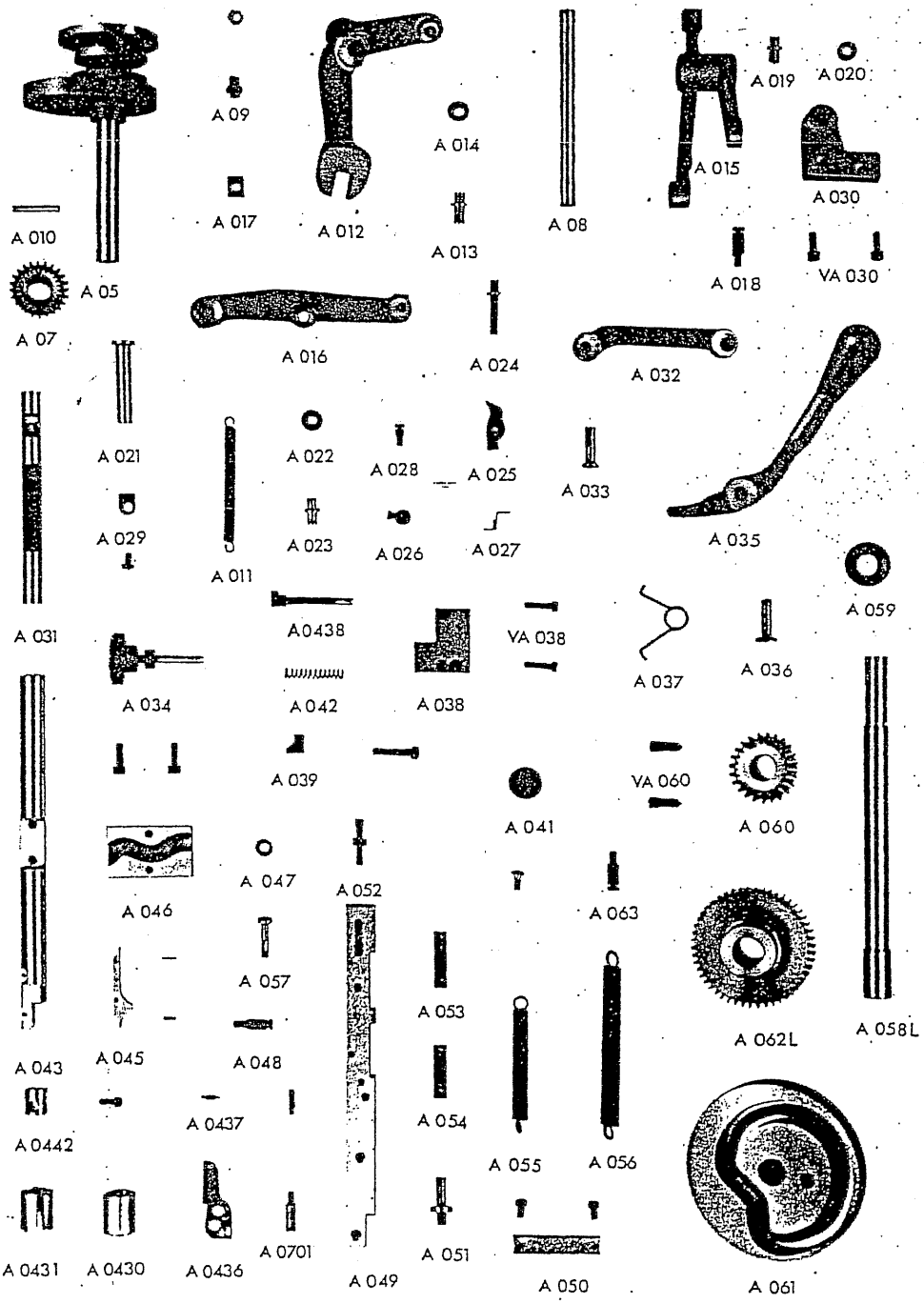
HARDO | Spare Part List

Typ: Stitching Machine | For Drawing: E 85.96.01.00.04

Main Group: ST 90 MAXI HORN | Sub Group:

Item	Text	Reference No.:
A 035	Presserfoot lifting lever	96.01.35.09
A 036	Presserfoot pivot cable stud	96.01.36.09
A 037	Presserfoot lifting lever spring	96.01.37.09
A 038	Presserfoot hold down block - 2 V	96.01.38.09
A 039	Presserfoot lift adjusting block 1 V	96.01.39.09
A 0438	Adjusting hold down pin	96.01.40.09
A 041	Adjusting hold down pin knob	96.01.41.09
A 042	Adjusting hold down pin spring	96.01.42.09
A 043	Needle bar	96.01.43.09
A 0442	Needle clamp - 1 V	96.01.44.09
A 045	Thread lifting cam - 2 plugs	96.01.45.09
A 046	Needle cam - 2 V	96.01.46.09
A 047	Needle cam roll	96.01.47.09
A 048	Presserfoot bar spring connecting pin	96.01.48.09
A 049	Presserfoot bar	96.01.49.09
A 050	Presserfoot bar retaining plate 2 V	96.01.50.09
A 051	Feed cam lever connecting arm stud 1D	96.01.51.09
A 052	Presserfoot adjusting screw	96.01.52.09
A 053	Presserfoot lift rack 2 V	96.01.53.09
A 054	Lift hold down rack - 2 V	96.01.54.09
A 055	Presserfoot bar spring	96.01.55.09
A 056	Feed lever spring	96.01.56.09
A 057	Presserfoot bar holding pin	96.01.57.09
A 058 L	Cam shaft	96.01.58.09
A 059	Cam shaft adjusting collar - 1 V	96.01.59.09
A 060	Gear - 2 V	96.01.60.09
A 061	Take up cam	96.01.61.09
A 062 L	Gear - Z 50	96.01.62.09
A 063	Presserfoot bar spring stud	96.01.63.09
A 0701	Fixed stud presserfoot lifting lever	96.01.64.09
A 0430	Bronze bushing for needle bar (upper)	96.01.65.09
A 0431	Bronze bushing for needle bar (lower)	96.01.66.09
A 0436	Lifting dog lever	96.01.67.09
A 0437	Lifting dog lever spring	96.01.68.09

TAVOLA N. 1


A 09
A 014
A 019
A 020
A 017
A 012
A 08
A 015
A 030
A 010
A 013
A 018
VA 030
A 05
A 07
A 016
A 024
A 032
A 021
A 022
A 028
A 025
A 033
A 035
A 029
A 023
A 026
A 027
A 011
A 031
A 0438
VA 038
A 059
A 037
A 036
A 034
A 042
A 038
A 039
VA 060
A 041
A 060
A 046
A 047
A 052
A 063
A 057
A 053
A 062L
A 058L
A 043
A 045
A 048
A 054
A 0437
A 055
A 056
A 0442
A 0431
A 0430
A 0436
A 0701
A 049
A 051
A 050
A 061

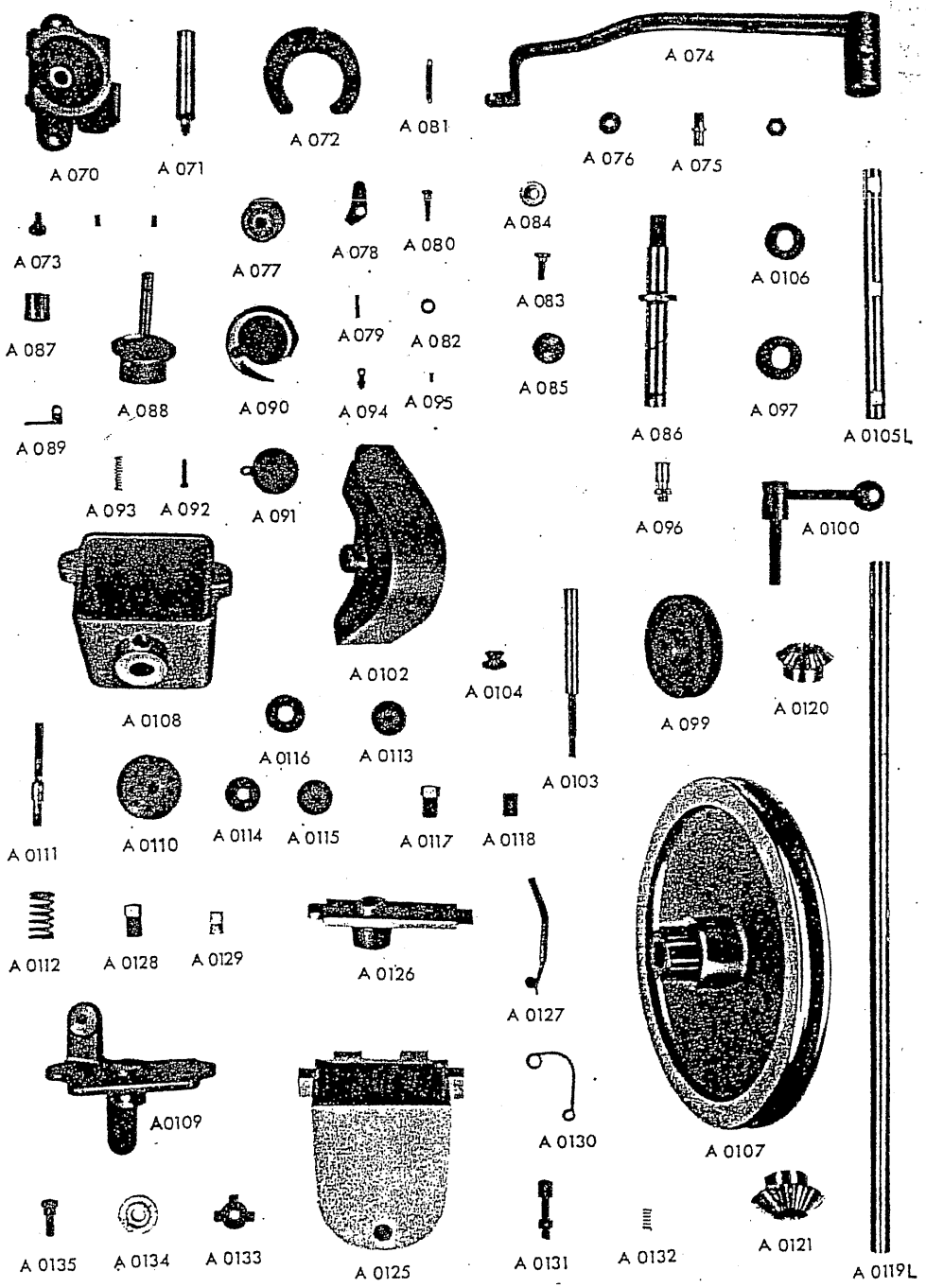
HARDO	Spare Part List
Typ: Stitching Machine	For Drawing: E 85.96.02.00.04
Main Group: ST 90 MAXI HORN	Sub Group:

Item	Text	Reference No.:	
A 070	Shuttle head - 2 V	96.02.01.09	
A 071	Shuttle electrical heater	96.02.02.09	
A 072	Shuttle ring 3 plugs	96.02.03.09	
A 073	Shuttle retaining nut	96.02.04.09	
A 074	Take up lever	96.02.05.09	
A 075	Take up cam roll stud - 1 D	96.02.06.09	
A 076	Take up cam roll	96.02.07.09	
A 077	Bobbin	96.02.08.09	
A 078	Thread lifting lever - 1 V	96.02.09.09	
A 079	Thread lifting finger - 1 V	96.02.10.09	
A 080	Lifting lever roll stud	96.02.11.09	
A 081	Lifting lever spring	96.02.12.09	
A 082	Lifting lever roll	96.02.13.09	
A 083	Take up thread roll stud	96.02.14.09	
A 084	Take up thread roll	96.02.15.09	
A 085	Take up thread roll guard	96.02.16.09	
A 086	Hand wheel pivot pin	96.02.17.09	
A 087	Shuttle driver gear	96.02.18.09	
A 088	Shuttle driver - 1 V	96.02.19.09	
A 089	Loop opener	96.02.20.09	
A 090	Shuttle	96.02.21.09	
A 091	Bobbin keeper	96.02.22.09	
A 092	Bobbin keeper stud	96.02.23.09	
A 093	Bobbin keeper spring	96.02.24.09	
A 094	Bobbin tension plate	96.02.25.09	
A 095	Bobbin tension spring - 1 V	96.02.26.09	
A 096	Grase fitting	96.02.27.09	
A 097	Handwheel retaining collar	96.02.28.09	
A 099	Pulley for winding the spool	96.02.29.09	
A 0100	Handle to block the winding spool	96.02.30.09	
A 0102	Winding spool	96.02.31.09	
A 0103	Small shaft winding spool	96.02.32.09	
A 0104	Shagreened knob	96.02.33.09	
A 0105L	Shaft for lever pull	96.02.34.09	
A 0106	Fixing ring	96.02.35.09	
A 0107	Handwheel gear	96.02.36.09	

HARDO	Spare Part List
Typ: Stitching Machine	For Drawing: E 85.96.02.00.04
Main Group: ST90 MAXI HORN	Sub Group:

Item	Text	Reference No.:
AB 0107	Handwheel with gear	96.02.37.09
A 0108	Wax pot - 2 V	96.02.38.09
A 0109	Wax pot lid	96.02.39.09
A 0110	Tension wheel	96.02.40.09
A 0111	Tension wheel stud	96.02.41.09
A 0112	Tension wheel spring	96.02.42.09
A 0113	Tension wheel adjusting nut	96.02.43.09
A 0114	Tension wheel washer	96.02.44.09
A 0115	Tension Wheel washer square hole	96.02.45.09
A 0116	Tension wheel friction washer	96.02.46.09
A 0117	Stripper plug	96.02.47.09
A 0118	Rubber stripper	96.02.48.09
A 0119L	Vertical shaft	96.02.49.09
A 0120	Upper gear	96.02.50.09
A 0121	Lower gear	96.02.51.09
A 0125	Wax heater pot	96.02.52.09
A 0126	Stripper plug support	96.02.53.09
A 0127	Thread keeper	96.02.54.09
A 0128	Stripper plug	96.02.55.09
A 0129L	Felt stripper	96.02.56.09
A 0130L	Guide thread spring	96.02.57.09
A 0131L	Guide thread stud - 2 D	96.02.58.09
A 0132L	Guide thread spring	96.02.59.09
A 0133L	Wax pot thread roll guard	96.02.60.09
A 0134L	Wax pot thread roll	96.02.61.09
A 0135	Wax pot thread roll stud	96.02.62.09

TAVOLA N. 2


A 070
A 071
A 072
A 081
A 074
A 076
A 075
A 073
A 077
A 078
A 080
A 084
A 083
A 106
A 087
A 088
A 090
A 079
A 082
A 085
A 086
A 097
A 0105L
A 089
A 094
A 095
A 093
A 092
A 091
A 096
A 0100
A 0102
A 0104
A 0108
A 0116
A 0113
A 099
A 0120
A 0103
A 0111
A 0110
A 0114
A 0115
A 0117
A 0118
A 0112
A 0128
A 0129
A 0126
A 0127
A 0107
A0109
A 0130
A 0135
A 0134
A 0133
A 0125
A 0131
A 0132
A 0121
A 0119L

HARDO	Spare Part List
Typ: Stitching Machine	For Drawing: E 85.96.03.00.04
Main Group: ST90 MAXI HORN	Sub Group:

Item	Text	Reference No.:
0109	Shaft	96.03.01.09
0110	Gear	96.03.02.09
0111	Gear pin	96.03.03.09
0112	Thread lock cam - 2 V	96.03.04.09
0113	Gear - 2 V	96.03.05.09
0114	Thread lock lever	96.03.06.09
0115	Thread lock lever pivot stud - 1 V	96.03.07.09
0116	Thread lock lever retaining collar 1V	96.03.08.09
0117	Lock lever roll stud - 1 D	96.03.09.09
0118	Lock lever roll	96.03.10.09
0119	Lock lever adjusting plate - 1 D	96.03.11.09
0120	Lock lever stationary plate - 1 V	96.03.12.09
0121	Lock lever thread guide	96.03.13.09
0122	Auxiliary take up lever	96.03.14.09
0123	Auxiliary take up lever pivot stud 1V	96.03.15.09
0124	Auxiliary take up thread roll guard	96.03.16.09
0125	Auxiliary take up thread roll	96.03.17.09
0126	Thread lock stationary plate holder	96.03.18.09
0127	Thread lock release spring	96.03.19.09
0128	Horn support base - 3 V	96.03.20.09
0129L	Horn base - 4 V	96.03.21.09
0130L	Adjusting collar - 1 V	96.03.22.09
0131L	Horn base bearing upper	96.03.23.09
0132L	Horn base bearing lower	96.03.24.09
0133L	Horn base lower pinion shaft	96.03.25.09
0134L	Lower pinion shaft gear (upper)	96.03.26.09
0135	Lower pinion shaft gear (lower)	96.03.27.09
	FEET - REST	
A 064	Presserfoot screw	96.03.28.09
A 068	Shoe guide roll	96.03.29.09
A 069	Shoe guide stud	96.03.30.09

HARDO	Spare Part List
Typ: Stitching Machine	For Drawing: E 85,96.03.00.04
Main Group: ST 90 MAXI HORN	Sub Group:

Item	Text	Reference No.:	
	HORN - PARTS		
530 L	Horn	96.03.31.09	
531 L	Front cover - 2 V	96.03.32.09	
532	Thread retaining clip - 1 V	96.03.33.09	
533	Whirl	96.03.34.09	
534	Horn tip	96.03.35.09	
535	Horn cap - 2 V	96.03.36.09	
536	Pinion	96.03.37.09	
537	Pinion driving shaft	96.03.38.09	
538	Horn cover rear - 2 V	96.03.39.09	
539	Pinion drive shaft bushing	96.03.40.09	
540	Pinion adjusting screw	96.03.41.09	
541	Pinion drive shaft gear - 4 V	96.03.42.09	
542 L	Pinion drive shaft lower	96.03.43.09	
543 L	Pinion drive shaft gear lower - 1 D	96.03.44.09	
544	Lower pinion shaft bushing	96.03.45.09	
545	Lower pinion shaft bushing upper	96.03.46.09	
546 L	Lower pinion shaft bushing spacer	96.03.47.09	
547	Lower horn thread roll	96.03.48.09	
548	Upper horn thread roll	96.03.49.09	

TAVOLA N. 3

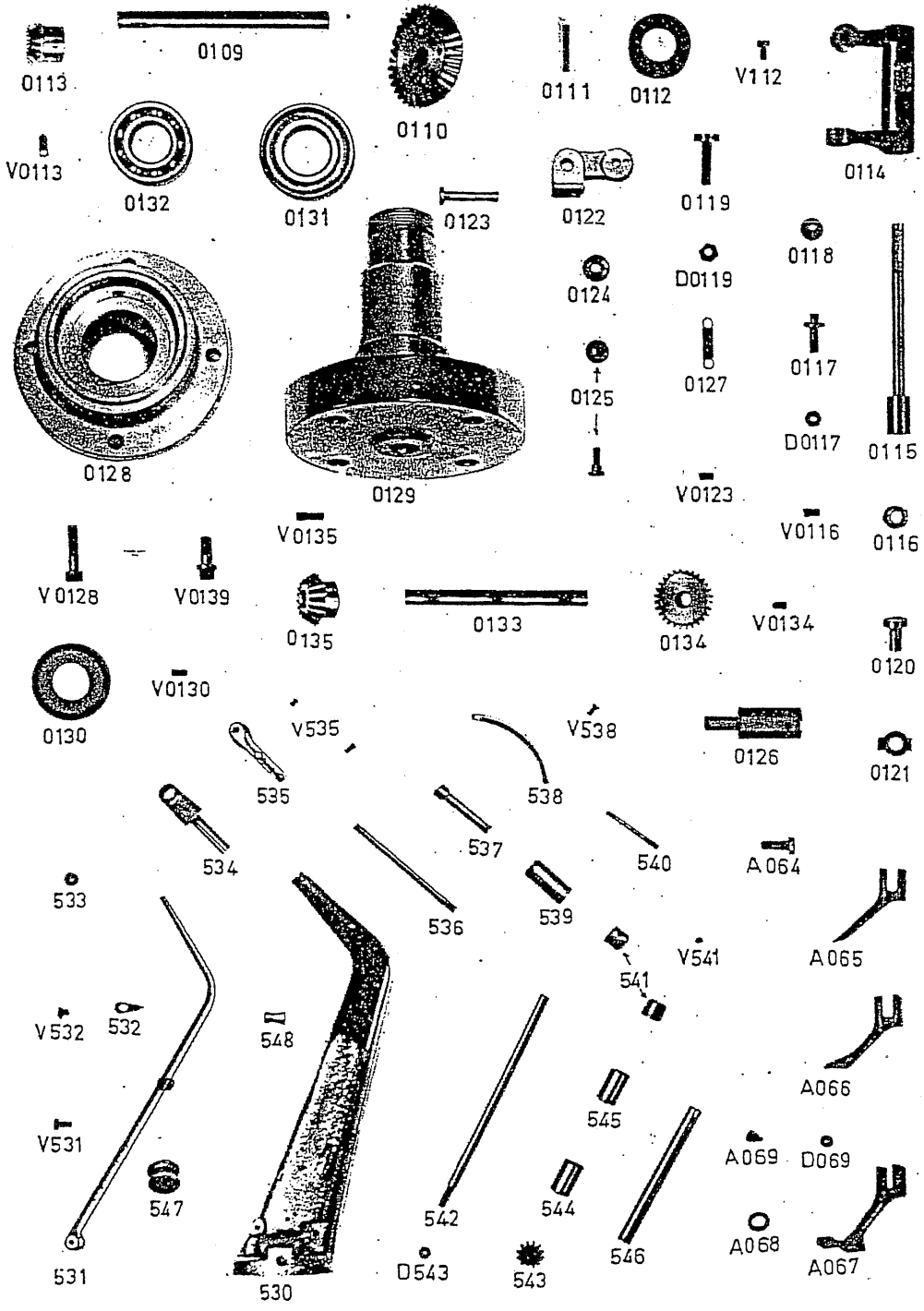
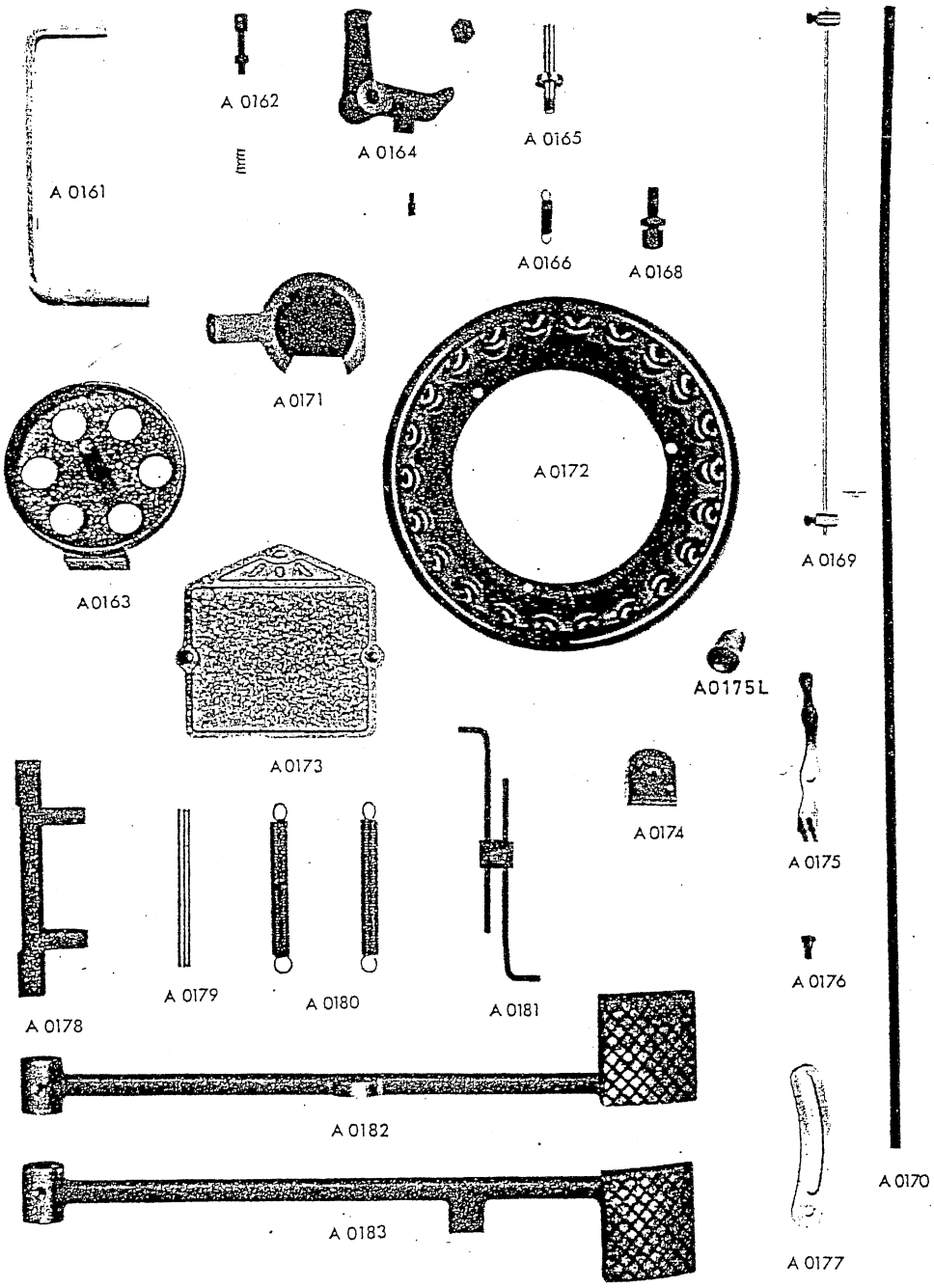

0109
0113
0110
0111
0112
V112
V0113
0132
0131
0123
0122
0119
0114
0124
D0119
0118
0125
0127
0117
0128
0129
D0117
0115
V0123
V0135
V0116
0116
V0128
V0139
0135
0133
0134
V0134
0120
0130
V0130
V535
V538
0126
0121
535
538
534
537
540
A064
533
536
539
541
V541
A065
V532
532
548
A066
545
V531
A069
D069
547
542
544
546
A068
A067
531
D543
543
530

TAVOLA N. 4


A 0161
A 0162
A 0164
A 0165
A 0166
A 0168
A 0171
A 0172
A 0163
A 0173
A 0175L
A 0169
A 0174
A 0175
A 0176
A 0178
A 0179
A 0180
A 0181
A 0182
A 0183
A 0177
A 0170